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THE GRADUATE VETERINARIANS OF 1921

A STUDY of the registration of students at the veterinary colleges of the country for the past year and the number of the 1921 graduates indicates that the low water mark in both registrations and graduates has been reached during the current year. The total number of veterinary students registered at all the colleges during the past year was only 973, as compared with 1,314 the previous year and 2,992 in 1916, the year before the entry of our country into the world war. The number of graduates shows a corresponding decrease, being only 277, as compared with 375 in 1920 and 867 in 1918, the banner year. The reasons for this large falling off in both registrations and graduates are probably apparent to most of our readers and need not be enumerated. In this connection it is interesting to know that the statement was made at the last meeting of the A. V. M. A. that 2,300 American citizens were pursuing a veterinary course with one Canadian correspondence school, which seems to show that the desire for at least a smattering of veterinary education still springs eternal in the American breast.

Three of the former veterinary colleges, Chicago, Cincinnati and McKillip, did not open for the 1920-21 school year, and two of the State colleges, Georgia and Texas, lengthened their veterinary course to cover a period of four years.

A detailed statement of the number of graduates by colleges follows:

College	Number of graduates
Alabama Polytechnic	5
Colorado State	20
Indiana	64
Iowa State	20
Kansas State	23
Michigan State	7
New York State (Cornell)	15
New York State (N. Y. City)	8
Ohio State	24
Ontario (Canada)	10
University of Pennsylvania	11
St. Joseph	37
United States	12
Washington State	12
Georgia State	3
Texas State	6

RIBS IN THE MORGAN HORSE

UNDER the above captain S. R. Winters has written an interesting article in the July 2, 1921, issue of *The National Stockman and Farmer*. We are reproducing this article with some slight changes for the purpose of interesting our veterinary anatomists in this subject and we would appreciate receiving from them any information that they may have available or may collect on this topic.

The ancestry of the Morgan horse has been established beyond a peradventure, if we are to accept with a degree of finality the claim that one of the distinguishing characteristics of the breed is the possession of one less vertebra in the spinal column than other races of the equine family. The contention of breeders of Morgan horses that the Arabian offspring possessed only 18 thoracic and five lumbar vertebrae has been recently verified by scientific observation.

The carcass of the Morgan stallion, "General Gates," whose death took place last January, was exhumed for the specific object of verifying the theory relating to the number of vertebrae in the spine of this breed. Proof was evident that "General Gates" had only 23 such vertebrae, whereas most other breeds of horses possess 24. Another stallion whose carcass was exhumed

on the Government farm for the same purpose was "Pat Murphy." The number of vertebrae in this instance was likewise found to be 23.

The investigations to establish beyond the realm of dispute the ancestry of the Morgan horse were originally promoted by C. C. Stillman, secretary of the Morgan Horse Club. The skeleton of the stallion "Donald" has been mounted and is on exhibition in New York City. The stallion "Dude" has also been mounted and is being exhibited by the American Museum of Natural History in New York City. The specific object of these displays is to offer tangible proof of the unquestioned ancestry of the Morgan breed, one of the characteristics being the absence of one lumbar vertebra, compared to the number common to other species of the equine family.

Zoologists have recently become interested in the subject, notable among the group being Septimus Sisson, Professor of Veterinary Anatomy at Ohio State University. In a letter to J. O. Williams, senior husbandman of the Bureau of Animal Industry, he writes: "The old statement of Samson to the effect that the Barb or African breeds of horses always have five lumbar vertebrae and that this is a special character of these horses has been already shown to be erroneous. I have had little opportunity to examine in this respect these breeds of horses but the observations of several French veterinarians have established the fact that these types are no more subject to this pecularity than other horses. I find from quite numerous observations that the occurrence of 19 pairs of ribs in horses of all types is quite common, much more frequent than was thought to be the case." Subsequently, Professor Sisson writes as follows: "I may say that we have just dissected a horse which has 18 thoracic and 5 lumbar vertebrae. I may add that this reduction in the number of vertebrae is not common in our experience."

Let us hear from others.

THE DENVER CONVENTION

This issue of the JOURNAL goes to its readers on the eve of the fifty-ninth annual meeting of the A. V. M. A. at Denver. The October number will contain a report of the convention and the President's address, and the official proceedings and other papers will follow from month to month.

FAT NECROSIS IN CATTLE

By W. A. HAGAN

Department of Pathology and Bacteriology, New York State Veterinary College at Cornell University, Ithaca, New York

IT IS not my purpose in presenting this paper to bring out anything new on the pathology of fat necrosis. I wish merely to call attention to its incidence among cattle, describe the lesions as I have seen them, and give a brief review of what is known of this rather interesting disease.

Fat necrosis appears to be quite a well-known condition in man, and a voluminous literature on it exists (1-9). Records of its occurrence among animals, however, are few, and most of these are brief and incomplete. According to the literature that I have been able to find, the disease occurs most often in dogs and hogs (10-14). It has been reported as occurring in sheep and horses (10). I have seen but a single reference to its occurrence in cattle, and in this case no details of any kind are given (15). This seems rather strange, for the disease appears to be not at all uncommon among cattle in New York and presumably in other States of the United States.

During the last three years a considerable number of specimens of necrotic fat from cattle have been sent to the diagnostic laboratory of the New York State Veterinary College at Cornell University by competent veterinarians who in all cases failed to recognize the condition. In several of these cases the animals had been killed following condemnation for tuberculosis, and it was thought that the condition was some peculiar form of this disease. I have autopsied three cows in which this condition was found. In one case, a valuable Jersey, the necrotic fat was unquestionably the cause of death; in another it was at least one of the principal contributing causes, and in the third the lesions were small and of little consequence as far as the health of the animal was concerned.

As a rule, I do not think that the disease, per se, is of much consequence. Its principal significance lies in the fact that the lesions, especially when small, have been and are likely to be interpreted as tuberculous lesions. In these days of active campaigning against tuberculosis in cattle, with the frequent au-

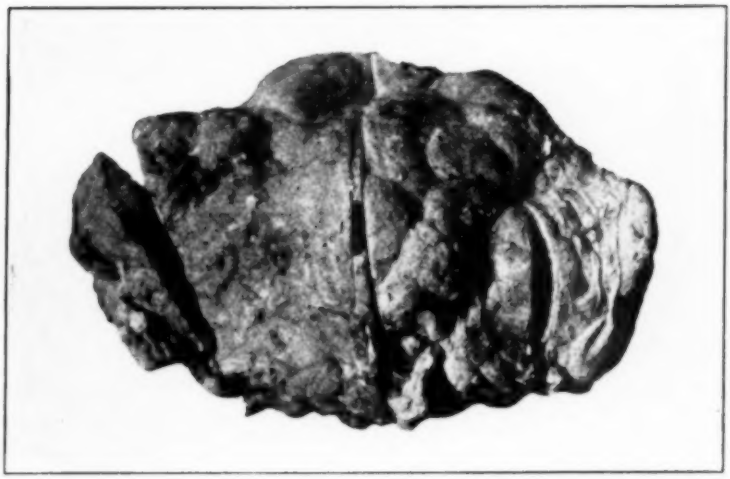

Fig. 1.—Perirenal fat, bovine. Reduced to about one-fourth natural size. Practically the entire mass is necrotic. The lumpy, irregular character of the surface of the fat may be seen.

topsing of reacting animals, it is highly desirable that all tubercle-like lesions be as well differentiated as possible from the true lesion in the minds of those making the autopsies, so that fewer errors will occur and better data on the reliability of the several tests be accumulated.

Fat necrosis in man, because of its frequent occurrence in con-

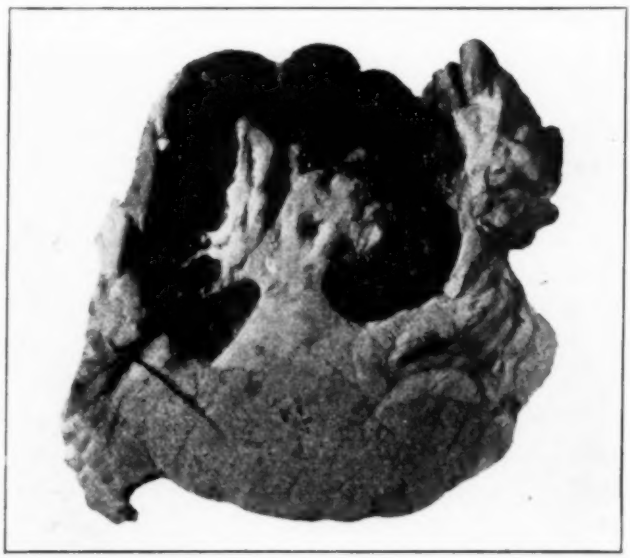

Fig. 2.—Same as Fig. 1. Cross section. The necrotic fat is seen as an oval mass in the lower part of the figure.

junction with evident disease of the pancreas, was long ago attributed to the action of the fat-digesting enzyme of that organ, lipase, which, it was supposed, had been liberated pathologically into the body tissues (16, 17). In cases of hemorrhagic pancreatitis necrosis of fat in the neighborhood of that organ invariably occurs, and instances are recorded of a similar result when the organ had been lacerated accidently on the operating table (1). The condition has been found also when there were no evident lesions in the pancreas.

Experimentally, fat necrosis has been produced by ligating the pancreatic duct, by lacerating the organ, and by placing pieces of sterile pancreas into pockets made in the subcutaneous tissue (9). Flexner was able to show that in the affected areas a fat-splitting enzyme was present, while this enzyme was absent in normal fat (7). Evidence is strong, therefore, and it is generally accepted as conclusive, that fat necrosis in man is due to the escape of the lipolytic or fat-splitting enzyme from a diseased pancreas, even though in some cases no disease of that organ can be detected.

Necrosis of fat is found, except in very unusual cases. only in the fat of the abdominal cavity. In cattle the location seems to be most often in the mesenteric fat. It is seen also in the perirenal fat and in the collections often found on the serous surfaces of the stomach. The affected areas are yellowish-white, sometimes chalky white in color, and opaque. In size they vary from that of the head of a pin to that of a man's head or even larger. The consistency is quite hard, much denser than normal fat. The masses are usually irregular in outline so that affected fat takes on a hard, lumpy, nodular character. When cut in cross section the affected part presents a dry, hard, cheesy, opaque appearance quite in contrast to the normal surrounding fat. Sometimes chalk-like calcified areas are seen within the necrotic masses. It is when the lesions are of small size, few in number and located in small areas of fat that they are apt to be mistaken for tubercles. Location of these areas in the mesentery close to the intestine or closely attached to the wall of the rumen or reticulum is especially apt to mislead, the impression being easily gained that they are located in small mesenteric or gastric lymph glands.

The microscopic picture of necrotic fat is interesting. Normal fat, if it has not been treated with some fat solvent in the process

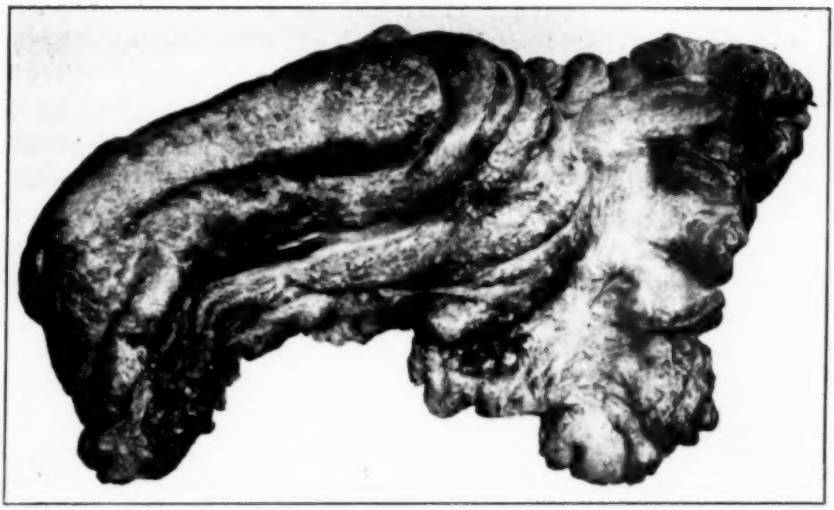

Fig. 3.—Mass of intestine surrounded by necrotic fat, bovine. From the fatal case mentioned in the text. The irregular, nodular character of the fat surrounding the intestinal loops is evident.

of preparation for microscopic examination, shows myriads of fat droplets, each being inclosed in a cell which has been reduced to a thin encircling band around the droplet. Areas of necrotic fat tissue show, instead of these clear, transparent fat droplets inside the fat cells, masses of opaque, whitish, needle-like crystals or clumps of amorphous material. When the fat has been dis-

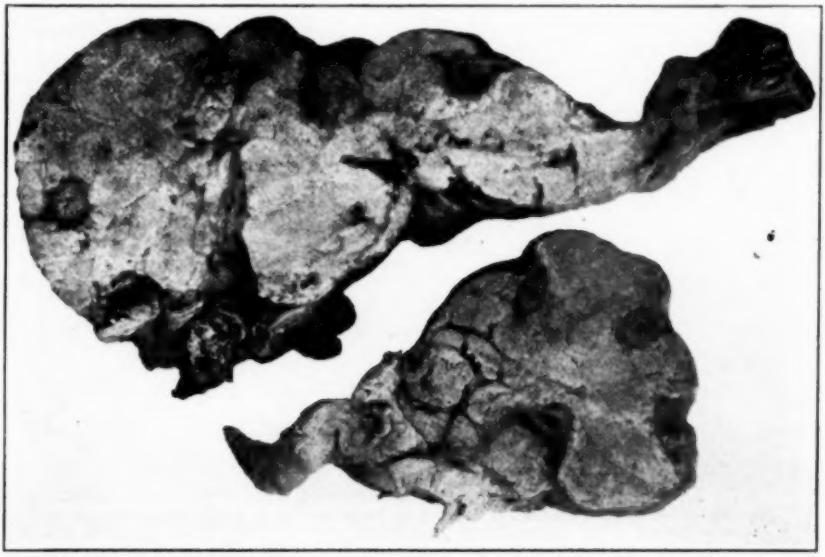

Fig. 4.—Same as Fig 3. Cross section. Almost the entire mass is necrotic. The sections of the intestine may be seen here and there.

solved out with any of the usual solvents, these needles and debris remain. They have been demonstrated to be crystals of fatty acids and salts of these acids, notably lime salts (6, 16). The presence of the lipolytic substance in the fat tissue causes a breaking down of the fat globules into their chemical constituents, fatty acids and glycerin. The glycerin is readily absorbed but the fatty acids remain as such in part and in part are neutralized by the body fluids to form salts or soaps, principally the highly insoluble lime soaps. It is the presence of these soaps in the place of the normal fat globules that gives the tissue its yellowish white, caseous appearance.

In the descriptions of fat necrosis of man, dogs and hogs found in the literature, it is stated that the lesions are generally located in the interlobular fat of the pancreas or in the immediate vicinity of that organ, and, too, that pancreatis, frequently of a hemorrhagic nature, is observed. As to the connection between fat necrosis and diseases of the pancreas in cattle I have little information and that of a negative character. In most of the cases which have come to my attention I have seen only the af-

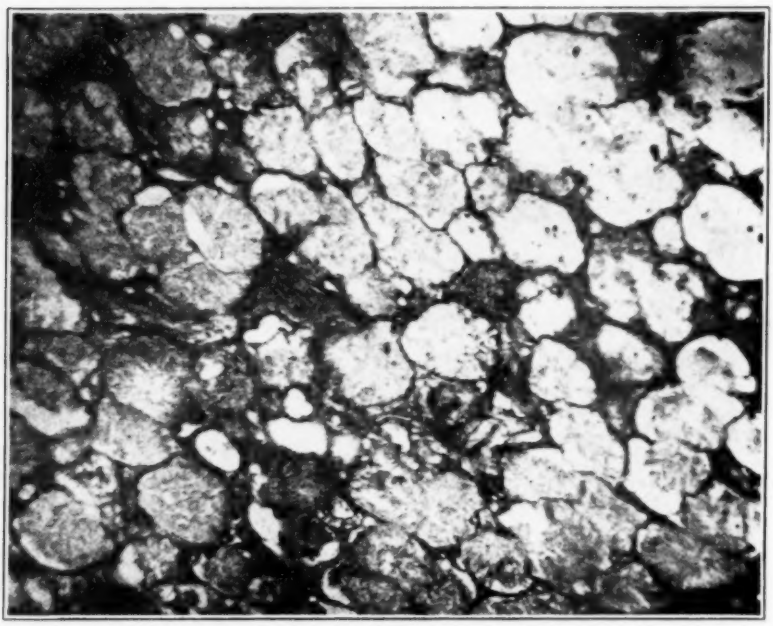

Fig. 5.—Necrotic fat, bovine. Photomicrograph, X85. The fat has been dissolved out. The fat cells contain long acicular crystals in some cases and amorphous material in others. The crystals always radiate from the center of each fat cell. This material is said to be made up of lime salts of the fatty acids which are liberated by the decomposition of the fat.

fected tissues which had been removed at autopsy by others and sent in to the laboratory for examination. In none of these cases has any mention been made of the presence of pancreatic lesions of any sort, but unless these lesions were very striking it is quite likely that they would be overlooked, since this organ usually receives scant attention at the postmortem as usually conducted. In the cases which I have autopsied personally no gross pancreatic changes were found. A microscopic examination was made in one case, but no pathological changes were discovered.

The case mentioned above, in which the fat necrosis was responsible for the death of a cow, is deserving of description here. The subject was a very valuable purebred Jersey cow which had been sent to this college to be observed and treated for sterility by Prof. W. L. Williams. At the time I was working in Prof. Williams' department and had ample opportunity to observe the case while living and to hold an autopsy after death.

The cow soon after reaching Ithaca began to lose flesh, and a slight, persistent diarrhea began. The appetite failed until after several weeks she could be induced to take only a little water. A tuberculin test was negative. Examination of the

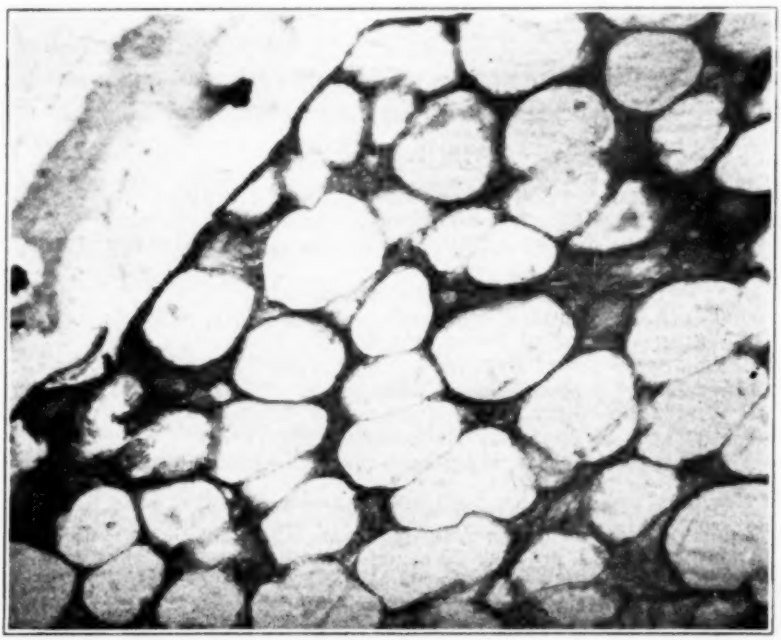

Fig. 6.—Partially necrotic fat, bovine. Photomicrograph, X85. In this case most of the cells are normal. A few contain crystalline masses. The section was taken just beyond the margin of a grossly evident necrotic mass of fat.

feces for the bacillus of Johne's disease was likewise negative. She did not appear to be in pain at any time. When emaciation had become far advanced and it was evident that she would die soon, she was destroyed and autopsied immediately.

The lesions were confined to the abdominal cavity. Almost the entire mass of intestines were inclosed in a single huge mass of fat, a great part of which was necrotic. The fatty mass had completely surrounded entire loops of the bowel, and when necrosis began to occur the imprisoned loops were inclosed in a hard cheesy material of a non-yielding character which had practically stopped peristaltic action.

SUMMARY

1. Fat necrosis is a not infrequent disease of cattle in certain parts of this country.

2. The lesions are confined to the fat of the abdominal cavity. The mesenteric fat is especially apt to be affected.

3. The lesions, especially when small and located in regions where lymph nodes occur, may be mistaken for tubercles.

4. No gross pancreatic lesions have been observed in connection with the disease. In the only pancreas examined microscopically in connection with the disease no pathological changes were noted.

5. The condition, per se, is usually of little consequence. Occasionally, however, the condition may prove fatal.

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THE TREATMENT OF EXTENSIVE BURNS AND THE REGENERATION OF SKIN OVER GRANULATING WOUNDS [1]

By JOHN PATTERSON, *Hedrick, Iowa*

THE PURPOSE of this paper is not to bring out any new or original ideas in the treatment of burns, but rather to give an opinion on the many prescribed methods of treatment of these conditions, their comparative values, and, in a general way, discuss the progressive treatment of extensive burns from the initial treatment up to the final production of new skin over the burned areas. The ideas presented are based on the results of several months' care of several purebred cattle caught in a burning barn.

DEGREES OF BURNS

From a pathological standpoint burns are considered in four classes, depending on the degree of the burn: First, there is simply a reddening or hyperemia of the skin; second, blisters are formed; third, there is scar formation resulting from the burn; sloughing of the burned areas occurs, which follows a demarking inflammation and suppuration beneath the destroyed skin; fourth, the parts are charred or burned to a cinder.

It is not uncommon to find burns of all four degrees on the same animal. The first is not necessarily serious, either with reference to the method of treatment or certainty of recovery, especially if no large area is involved. First degree burns become serious when enough of the skin is burned to destroy its respiratory function and destructive changes take place in the capillary blood. Some extraordinary condition must be present to produce a simple hyperemia over a large area without some of the more serious degrees occurring.

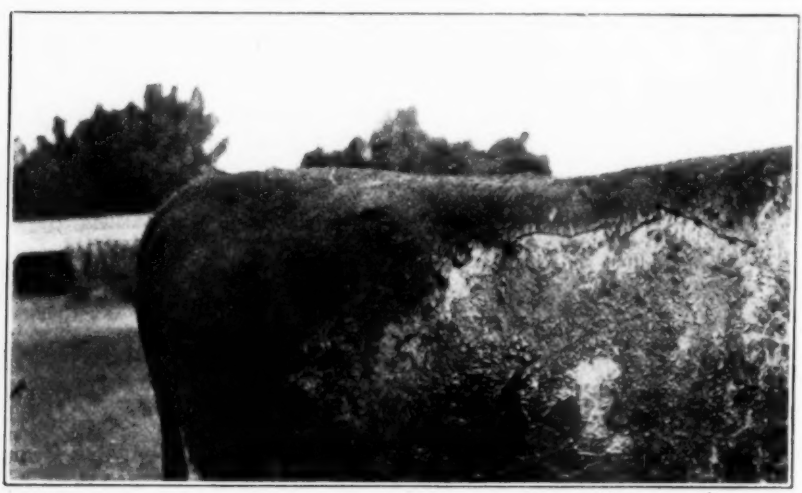
Since the second and third degrees, and sometimes the fourth, go hand in hand, the classification is not essentially of practical importance. It has been said that when one-fourth or one-third of the body is burned, death is almost certain. We have personally witnessed that this is not necessarily the truth for in this particular fire there were several animals burned on a half or

[1] Presented at the Thirty-third Annual Meeting of the Iowa Veterinary Association, Des Moines, Iowa, January, 1921.

two-thirds of the entire body surface. When the inhalation of fire and hot gases have destroyed or injured the mucous membranes of the respiratory tract, then the mortality is high regardless of the amount of skin involved. Inhalation pneumonia, resulting from heat and gases or the gravitation of necrotic material from the upper respiratory tract, is fatal. Death is frequently caused by carbon dioxide poisoning, resulting from the diminished respiratory function of the capillaries in the destroyed skin, and the same holds true in case the lung has been injured by gases. It is also claimed that the action of intense heat on the blood destroys the red cells, freeing hemoglobin, which not only becomes toxic, but also diminishes the oxygen-carrying capacity of the blood. When hemoglobinuria is present the prognosis is very doubtful. The animals may seem to go through the first few days with prospects of recovery, but they may die later from septicemia when the burned areas become infected and sloughing begins.

TREATMENT OF BURNS

Few animals will show evidence of shock, but when such happens it is invariably preceded by a chill. At first the animals are frantic from the excitement and intense pain, which delays examination as well as treatment. Injection of morphine at this time



This p.cture was taken after all of the burned skin had come off and the entire side of the cow was a raw, bleeding surface. The light, irregular area in the center was the deepest burn, and the last to heal over. The entire skin at this place was destroyed, and when healing was complete it was the only surface not covered with a thin coat of hair.

is very important, not only to allay pain and quiet the animal, but the fact has been established that it exerts a very pronounced action in the prevention of the absorption of toxic material. This may be administered for several days or until it is apparent that toxemia has been at least temporarily aborted and the channels of elimination are working well. It is essential that the bowels be kept in a laxative condition and that drinking water be accessible at all times. Rectal injections will supply the body with water, stimulate bowel movement, assist materially in the control of high temperature and in case the mouth is burned it is the only way that water can be supplied. Cooling mashes and green feeds are the ideal feeds. When a large area of the body is burned, the medicinal antipyretics are not of much value for the reason that the capillaries upon which they act have been destroyed. In case morphine is being used in the early stages their actions will be antagonistic.

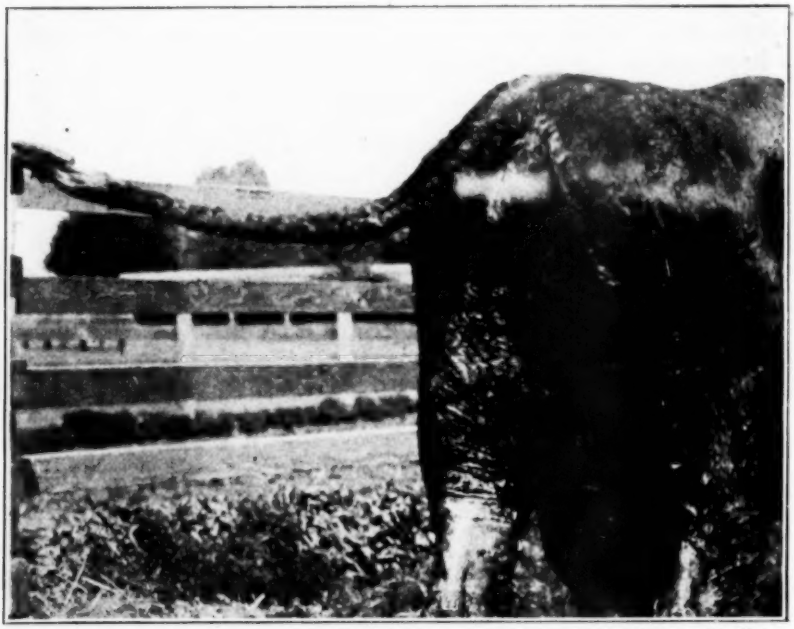
Just as soon as possible all burned areas should be literally drenched with carron oil, one of the oldest preparations on the list and the best, not only because of its efficiency but because of the fact that it is the one thing that can be had in a few minutes and in any quantity from any office or drugstore. It is readily prepared by using equal parts of raw linseed oil and lime water. On all parts which may be bandaged it is applied on cotton, which is kept soaked all the time, changing the cotton when its condition indicates that this should be done. On the other parts of the body it is best applied with a large, soft, flat brush. More oil can be applied with a brush of this kind than with cotton swabs and with less pressure and pain to the animal.

Paraffin preparations are not as efficient for the reason that they will not cling to the surface, are loosened by every movement of the skin, rubbed off easily, difficult to apply and do not afford the same amount of protection that a coat of oil, applied every few hours, does.

Ointments and grease preparations of all kinds are not satisfactory from the standpoint of cost, method of application and the fact that they will not cling to the surface of a wound after it becomes moist with wound discharge.

When possible to do so, very good results may be had by binding on cotton soaked with a saturated solution of picric acid. It has a tendency to be astringent, is antiseptic and will allay pain better than any other agent which may be applied locally. Some

This cow was burned from her tail to the end of her nose just as badly as is shown on the hind quarter. Her legs were burned from the bottom of the hoofs to her body. The back was burned as well as the skin of the abdomen. The cow stood in a stall bedded deeply with straw and was caught by falling timbers. While she was the most badly burned cow of all, she made a beautiful recovery, simply because the burns were not deep enough to destroy the deeper layers of skin. The hair came in practically as thick as it had been before.



This was a nurse cow and most of the burned area is shown in the picture. She was giving a heavy flow of milk and a severe mastitis followed. The teats were split, and finally two were amputated in order to afford drainage.

cases may be treated successfully from start to finish with picric acid solution because it is very efficient in keeping down excessive granulations and assisting epithelial growth.

Where the burns are deep the skin begins to loosen up and slough off in a week or ten days. Sometimes large areas of tough, leathery skin will be undermined by a thick creamy pus, which must be removed at once. The loose parts are removed with forceps and scissors and the attached portions allowed to slough. It is absolutely essential that the case be examined each day and all pus and loose skin be removed. Time and patience must be used at this process, for not only does the pus gravitate into healthy tissues but absorption takes place, the temperature then runs up and a fatal septicemia results.

Washing the parts with aqueous solutions is not advisable. If done sufficiently to cleanse, the tissues are irritated and you have a large surface oozing blood from every point. Everything that needs to come off can be removed with the brush while applying the oil, and the raw surfaces beneath will not be injured. This use of the brush is a very important point and is worth bearing in mind.

When the infection seems to be too severe and there is a continuous production of pus in the wound discharge, a five or ten per cent solution of liquor cresolis compositus in raw oil will cleanse it and stop the pus production. When the whole side of an animal, from the head to tail, is denuded of skin there is a copious flow of serum from the entire surface and it is a fertile field for pus organisms.

Aqueous antiseptics are not efficient for the reason that they will not cling to the surface long enough to exert any influence. Practically all of the agents in this class must remain for some time in contact with the bacteria before they are antiseptic, to say nothing of bactericidal in action. It is a self-evident fact that the good derived is more mechanical than anything else. At times it is necessary to paint small areas with tincture of iodine to control infection.

To assist the respiration and elimination through the skin, all non-burned portions of the body should be washed with soap and water and the body kept as clean as possible.

When the udder of a cow giving milk is burned, even in the first degree, a mastitis invariably results and destroys the parts. It starts with an acute inflammation, the epidermis comes off, the

parenchyma breaks down, and a thick, ropy fluid is discharged from the teats. Teat tubes may be used for a few days to keep the udder drained, but in a week's time the teats must either be amputated or split to afford drainage of the material which by this time has become too thick to be milked out. Constant attention must be given to drainage and cleanliness or a gangrenous udder is inevitable. The udder must be covered continuously with oil to facilitate shedding of skin, to keep it as soft as possible and prevent the formation of serious cracks and fissures.

There will be a separation at the coronary band when the feet are badly burned. Infection, which is bound to get a start in these places, is best controlled with tincture of iodine liberally applied each day. Swabs, frequently wet with cold antiseptic solutions, are indicated.

When the back is burned, the larvæ of the bot fly found there in the spring and early summer are killed. These readily decompose, and since they have already produced a passageway between the surface and the subcutis, a dangerous, burrowing subcutaneous infection will result unless they are removed and the cavity treated with strong antiseptics.

GRANULATION AND PRODUCTION OF NEW SKIN

After all the burned skin has sloughed, infection is under control and the dangers of toxemia and septicemia have passed, the problem of granulations and the production of new skin presents itself. Mention has previously been made of the value of picric acid. The ordinary mixtures and lotions used for barbwire cuts and the like are too irritating to use where large areas are denuded. Generally speaking, the problem is not to produce the formation of connective tissue granulation but to control it and keep it down. There is no cavity to fill up, but instead a large area to cover over with epithelium. The epithelium creeps out over the granulating tissue in much the same way that ice starts to form along the shore and gradually extends toward the center. If the surface of the water is rough the process is much slower, and if rough enough it is actually stopped. The same holds true with the growth of epithelium. If epithelial growth is stimulated and the ground structures are favorable it is only a matter of time until the process is complete. We have found that a 10 per cent solution of Beibrich's scarlet red in raw linseed oil is the best agent for this purpose. It is antiseptic, astringent to

the granulating connective tissue and stimulating to epithelium. Flies and insects of all kinds will keep away from it, and its action is lasting. An oily solution of pyoktannin blue is a close second in choice and is very efficient especially when the epithelial edges are getting close together.

Finally when the process seems about complete on some cases the epithelialization will stop when areas three or four inches in diameter are left uncovered. Literally the epithelium seems worn out and refuses to carry on and the connective tissue beneath takes a new start. For this condition the adhesive plaster dressing of the surgeon is highly satisfactory. The method of application and explanation of the rapid growth of epithelium can best be given by quoting from an article by Emil G. Beck in "Annals of Surgery," as follows:

The technic consists in applying strips of plain or zinc oxide adhesive plaster along the edges of the granulating wound. These strips, one-half to three-quarters of an inch wide, must be adjusted so that they cover both margins, that of the skin and the granulating wound. This leaves the center of the granulating surface exposed for the absorption of wound secretions by a dry dressing. Twenty-four hours later the dressing and adhesive plaster are carefully removed. It will be found that along the margin of the skin there has now been formed a bluish-gray border about two or three millimeters in width. This bluish-gray border represents the new growth of epithelial cells.

The wound is now dressed with a dry dressing which is left on for twenty-four hours, followed on the next day with another dressing of adhesive plaster. This procedure is repeated until the entire granulating surface is covered with an epithelial growth.

All necrotic material must be allowed to slough off, so that the base of the wound is clean, before we can expect the epithelium to grow. The wound must never be rubbed with gauze, as this will be apt to destroy the new epithelial cells.

A mistake which is frequently made is to draw the surfaces together with the adhesive strips. This is not the intention. On the contrary, the wound edges should be kept apart as much as possible, so that the skin may grow along a flat surface. When the skin grows into very deep recesses, so that the skin surfaces are in contact, we are likely to produce a pocket in which the skin secretions will accumulate and undergo decomposition.

The reason why large granulating surfaces have no tendency to be covered by epithelium is this: The granulation tissue grows much faster than the epithelial growth and thus we find that the granulating mass overlaps at the margin of the wound. In other words, the granulating mass is much higher than the skin level. The

epithelial growth stops at this margin because it cannot grow upwards over the elevated granulating surface.

In order to overcome this obstacle we must establish a level surface, merging from the skin over the granulating surface, and this is accomplished by pasting adhesive plaster over the margin. It keeps the granulations from rising higher than the skin and this gives the epithelium a chance to regenerate underneath the surface of the adhesive plaster. The epithelial cells will grow rapidly under these favorable conditions and cover as much as one-quarter inch in twenty four hours all around the wound, which is plainly visible by a bluish-gray border. The under surface of the adhesive plaster acts as a path for the regeneration of the cells, on the same principle that the vine would grow along a string of wire and cover within a short period the entire wall of a building. If the strings were not there the vine would grow in all directions. It is the string that keeps it close to the wall, and so with the adhesive, it furnishes a trellis for the growth of the epithelial cells

Sometimes it is necessary to cut away or pare down the excessive granulations and loosen or undercut the epithelial border in order that it may get a start.

A recent post card, written jointly by Dr. John Blattenberg, of Lima, Ohio, and Professor Frederick Hobday, of London, England, has been received by the Editor from the latter city, indicating that other topics than surgery were being investigated by our itinerant member.

Under the title "The Dirge of the Scrub," the *Ohio Farmer* publishes a feature article beginning: "The scrub sire is the most costly factor in our national livestock production." It gives the number of scrub bulls in the United States as 1,350,000 and points out the abundance of room for action in the campaign for better sires.

The Wisconsin Farmer points out editorially that farmers are saving thousands of dollars by having veterinarians treat all kinds of farm animals instead of merely horses as formerly. "Today the average veterinarian gives 26 per cent of his time to hogs, 21 per cent to cattle, 18 per cent to dogs, 10 per cent to sheep, 10 per cent to horses, 9 per cent to poultry, and 6 per cent to cats."

DISPENSING IN VETERINARY PRACTICE[1]

By H. B. WINTRINGHAM, *Petaluma, California*

WE ARE graduated from our colleges, supposedly, fully equipped to practice our profession. Theoretically, perhaps, we are, in so far as the science of the profession is concerned. Yet it is the author's opinion that our colleges are criminally inefficient in the preparation of the students as regards the practical side of the profession, and this condition is a serious offense, not only against the graduate, but against the public at large.

In the writer's opinion the practice of veterinary medicine for success may be divided into the following classes or divisions:

1. The science of disease and its treatment.
2. The prevention of disease.
3. The psychology of handling the client.
4. The dispensing of medicine.
5. General knowledge of the fundamentals pertaining to the livestock industry in its various branches.
6. Collections, charges and business management.
7. Practical application of the foregoing.

Now, the writer does not mean to convey the idea that these seven divisions are all that go to make up practice, for he realizes that many other items go to make for success. The use o these divisions is merely to emphasize the fact that it is his belief that perfection in any one of the above divisions will not spell success as we in general look upon that word. A successful practitioner must be a good business man. A practitioner looked up to by his colleagues and praised by his clients may continue for years, and yet when old age overtakes him find that in wordly goods he is not well provided for, and, as the world sees it, this is not success. Now please do not mistake the writer, for his belief is that there are other kinds of success aside from the accumulation of money. Still, it is his belief that some moderate success along this line in combination with other things goes to make up success in its fullest meaning. Aside from a few special branches that the profession has to offer, the day has come when we in general practice must use all legitimate means at our com-

[1] Presented at the meeting of the California Veterinary Medical Association, Fresno, California, June, 1921.

mand to make for ourselves that competency to which old age is entitled.

Let us now deal with that division of veterinary practice which is the title of this paper.

The student is taught, depending on the school which he attended, either to write prescriptions or to do his own dispensing—two absolutely opposite principles. The writing of prescriptions has always been looked upon as the height of ethics, and this principle is modeled more or less on the procedure used in human medicine and is free from taint of anything which is not open and above board. But in this highly ethical operation the student is taught to add odors and colors which have no value in the treatment of disease. Does not this lack of policy defeat the so-called ethics of prescription writing?

At the other extreme are the schools which teach dispensing with the idea that the articles dispensed should be secret in their preparation and that this secrecy would redound to the credit of the prescriber, inasmuch as it would take the services of a skilled chemist to make known the combination that went into the concoction. This procedure surely borders on quackery.

A middle course has proved to the writer to be the best business policy in a successful one-man practice as well as in a collective practice in which he is now associated.

Many physicians own pharmacies or interests in them, recognizing the profit to be derived from the sale of the drugs they prescribe. Why, then, should not the veterinarian own and operate his own pharmacy, not only deriving the profit from such a business procedure, but at the same time providing a convenience to his clients? If the clients are educated to come to the veterinarian for their animal remedies, will not they receive better service than by patronizing the drug store? A pharmacist is well versed in human dosage but sadly ignorant when it comes to animal doses, so that the protection in dosage afforded physicians by the dispensing druggists is a form of protection not available to veterinarians when it comes to animal doses.

Many veterinarians who dispense do not charge for the drugs they use, depending on a higher fee for their services to cover the cost of the dispensed remedies. We know that some cases require a minimum of medicine, while others may be said to require variety, and it is not in human nature to give away costly drugs even when indicated where the fee is the same as for a case that

requires the minimum. It is also a recognized fact that people do not value so highly those things which they gain free of charge as those things for which they pay. How often has the writer been called in on cases which another veterinarian had been treating and seen unused medicine lying about, and on asking the question, "Why did not you use the medicine which the other doctor prescribed?" was answered in this fashion: "Well, he said he would not charge me for that bottle, so I thought if it was that cheap and he could give it away it wouldn't do much good." In the early years of my own practice, when I was more charitably inclined, I have returned to a client and seen untouched a bottle that I had left on a previous case and for which I had not charged. But in later years, where the attention of the client was called to a subdivided bill for services and medicine, I have never yet seen an untouched bottle which had been prescribed previously.

It is safe to state that in any differences over a bill for our treatment the items to which exception is taken in 99 out of 100 cases are those for services and not the items of medicines or other supplies. It is also found that where exceptions are taken for drug charges courteous willingness on the part of the veterinarian to take back the medicine and write a prescription for it will end the argument then and there in the veterinarian's favor. If the client should in some few rare instances insist upon having a prescription and then have it filled, he will never again insist on that method of providing remedies for his animals, having once paid the bill at a pharmacy.

Good business decrees that a fair profit must be made on money invested, otherwise that business will be a failure. When we tie up capital in drugs, then figure space, containers, labels and other overhead, we are entitled to a profit on this investment, and no fair-minded person could contradict a statement of this kind. Nor should the dispensing veterinarian receive a less profit than the druggist. In the matter of charges for medicine let me call your attention to the fact that the general public has for years been educated by the pharmacy to pay liberally for prescriptions.

However, a dispensing veterinarian need not tie up his capital in the variety of drugs which a druggist must prescribe for many physicians. It is also true that in large-animal dispensing, at least, the quantity used makes for better prices when buy-

ing, so that the dispensing veterinarian may charge less and still make a larger profit on an article than a druggist.

Another reason why it is fairer to the client to dispense ourselves than to write prescriptions is that from the client's standpoint it is much more convenient for a veterinarian to be able at the time a case is being treated to dispense the drugs needed than to have the client perhaps travel miles to have a prescription filled. Also the case benefits as medication becomes immediate.

It seems logical to the writer, and in his hands has been proved beyond a doubt, that hypodermic medication should be charged for as well as bulk drugs. We vaccinate for hog cholera or anthrax or some other disease and charge for vaccine used. Why then is it not just as logical to charge for one dose of the various bacterins or soluble tablets used? For years we have charged one dollar per hypodermic injection for all ordinary tablets or bacterins. The writer hesitates to use a specific sum in this paper, still he sees no other way to bring more forcibly to attention the matter of charging for this kind of medication. He also believes that an established charge should be made for capsules in equine and bovine practice. Never once has he had a dispute over charging for this method of medication. No more is there a reason to supply bandages and dressings free of charge.

The question of the style of package to be used in dispensing plays an important part in this branch of our profession. Use your imagination. Do you think you can command the same price for an old paper bag of a recognized cow physic that you could for a neat box of the same properly labeled? The answer is hardly necessary. The powdered drugs should be dispensed in neat cartons, either with a printed label thereon or with a neat label on which the directions may be written. It is the writer's opinion that the powdered drugs in cartons are best purchased already put up from one of the various houses supplying them, and that if their standard formulas do not meet a veterinarian's requirements he would do better to have them put up his special formulas in attractive packages. Provided the order is large enough, he can procure them at a price hard for him to better, time and neatness considered.

As regards liquid preparations, an attractive package is again what is wanted. It is a habit of many veterinarians to get bottles from the junk stores or to pick them up here and there with

no regard to uniformity. My opinion is that this is a grave mistake. For a few cents per bottle more, uniform glassware can be bought in the various sizes needed. Liquid preparations for internal use should be put up with regard to uniformity of dosage in all preparations, so that the practitioner need not stop to remember that a certain combination has a certain dose. It will be found that a standard one-ounce dose for all preparations is a good standard for general use. Attractive labels, having on them the name, address and telephone number, also play an important part. If one stops to consider that packages so labeled, even after being used, may stand around the premises for years, one can see the advertising value of such labels.

Another phase of dispensing with regard to liquid preparations is the agent used to administer them. I find that a one-ounce hard rubber rectal syringe is both inexpensive and serviceable. A client likes something which makes it easy for him to administer liquids, and is willing to pay for it. The syringes can be bought from the wholesale drug or supply houses, and one can regulate the retail price to the client according to the price charged by the druggist in the locality, which will always leave a nice profit for the practitioner. The usefulness of these rubber syringes, when they are neglected, is rather short-lived, and in larger establishments where the number of animals will warrant the extra expense a metal syringe can be easily sold.

Many of our supply houses sell drugs in tablet form, and it is my opinion that drugs in this form should never be dispensed. For the active practitioner their accurate dosage makes them readily available for use in preparation. The required number of these tablets should be broken up, placed in a bottle, and a menstruum added. The price procured for dispensing these tablets in this way is far in excess of what might have been collected for the crude tablets dispensed as such.

The veterinarian dispensing as outlined above should keep his standard preparations and supplies well stocked up, not only in his office, but in his secondary office also, namely, his automobile. A complete line should be in his machine, and for carrying these it will be found that a metal box of the desired size, bolted to the running board and containing wooden subdivisions for the bottles, will very satisfactorily meet this requirement. Breakage in a container of this kind is reduced to a minimum. This metal box need be only large enough to carry one each of the standard

preparations, and on each return to the office it should be immediately refilled so that the next call may be taken without delay and with the knowledge that a full line of remedies is carried.

There is another side to dispensing, namely, biological products. We have laboratories which sell their products direct to the livestock owners, and, fortunately for us, those who sell to veterinarians only, or through veterinarians. On the face of it, it would seem that as a matter of self-preservation we should patronize only those laboratories which give us protection. However, even with this protection, we are forced to compete with those laboratories which sell direct or through the druggist. It is all very well for us to say that no biologics should be administered except by a veterinarian, but the fact remains that hundreds of thousands of animals are successfully vaccinated yearly by their owners, and, further, that our Government has encouraged administration of these products by owners through its years of free distribution of blackleg vaccine. There is only one course open for us, namely, to become the supply depots to owners wishing to use a hypodermic themselves.

I believe that veterinarians are overlooking a wonderful opportunity, not only in not catering to this trade, but also in not stimulating it. If the owner who does his own vaccinating comes to you for information along these lines, give it to him, but at the same time sell him all the products he will require, such as syringes, needles, antiseptics, etc., and also give him to understand that you are ready to furnish him locally with those products his needs require. If the practitioner will not do this, the man who does his own vaccinating will go to the drug store and get what he is after, or, failing that, a letter to some laboratory will bring his requirements to him. In other words, teach your clients to come to you for all their veterinary needs as well as services. Explain the advantages of the later biological products and the newer preparations as they are proved, for human beings are ever looking for improvements on old methods. I do not believe in the indiscriminate administration of virus vaccine, but the fact remains that if the practitioner will not supply these products the stockmen will go elsewhere and purchase. So I say sell these products, and at the same time advise the purchaser how they should be used. Your advice along the lines of handling will be a real help to the community as well as helping your business.

The question might well be asked, What is the relation of dispensing to the gross income of a well-balanced practice? I unhesitatingly state that the income from dispensing should be between 25 and 40 per cent, with 33 1-3 per cent as a good average, depending mainly on the locality and the class of general practice. These figures have been arrived at from carefully kept books over a period of years both in a one-man and in a collective practice. The only way in which a practitioner can determine this relationship is to keep books. These may be elaborate or simple. To those who have never given the field of dispensing much thought there is no doubt of the surprise awaiting you if you will keep a complete record of the income from your practice including drug sales.

To the public, drugs are mystic substances that are craved in times of sickness and often in health. The veterinarian who does not take advantage of this demand, investing a little capital and common sense, is overlooking a legitimate business opportunity which would probably mean a competency in old age.

"Cattlemen in the coast district of Texas are alarmed over the spread of a strange disease which they call—because they know of no other term—'down-in-the-back' disease. Already thousands of cattle have died from this malady and the recent outbreak of the trouble is said to be more severe than at any other time."—*American Hereford Journal.*

"Recent legislation enacted by the State legislature of Washington provides that all cattle over one year old exhibited at fairs within the State must have been tuberculin tested and received certificate of health at least six months before being shown."—*Wallaces' Farmer.*

The West Virginia correspondont of *Ohio Farmer* says: "The passage of the purebred-sire law by the recent legislature is declared by many of the leading livestock men of the State to mean the dawn of a new and better day for the livestock business of the State. Not only does this measure forbid the general use of scrub bulls, but it also includes boars, rams, stallions, etc., that are not purebred, registered animals."

ANAPHYLACTIC REACTIONS RESULTING FROM VACCINATION AGAINST ANTHRAX BY THE SERUM-SIMULTANEOUS METHOD

By W. J. TAYLOR *and* T. L. CASSERLY

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ANAPHYLACTIC reactions resulting from the injection of protein substances into the animal body have long been recognized. Our recent experience with this reaction in the cows of the Supply Department Dairy during immunization against anthrax by the serum-simultaneous method was such, we believe, as to justify publication. In localities where anthrax is present and the periodic vaccination against the disease is carried out, other veterinarians may encounter similar experiences, and the object of this notation is to call attention to its libability of occurrence, describe some of the manifestations of the reaction, and recount such measures as we have used to reduce the extremities arising therefrom as well as to prevent fatalities.

The dairy in which we encountered our experiences consists of some 700 native cows and about 70 registered Holsteins imported from the United States. When the dairy was first established in 1917 it was known that anthrax had previously existed in the areas which were to be used for pasturage. During the year all stock was immunized against anthrax by the Pasteur method. Assuming that the immunization was effective for only one year, all stock was again vaccinated in 1918, the same vaccine being used. In this second vaccination no ill effects were noted.

In 1919, shortly after the Holsteins were imported, all the cattle were given the serum-simultaneous vaccine during the months of March and April. As anthrax is more prevalent during the dry season in this latitude, the cattle were again vaccinated during December, 1919. The dry season being from about the first of December to April 15, it was thought best not to trust to the vaccinations carried out in March and April of that year, as it might be possible that some cattle, especially the Holsteins, would have lost their immunity by December. When these December vaccinations were administered Pasteur vaccine was again used, as our distance from the States for supplies did not warrant awaiting a shipment of the other vaccine and we

had the Pasteur vaccine on hand. Careful observation was made on all stock at this time, but no anaphylactic indications were noted.

In August, 1920, the stock was again vaccinated, the serum-simultaneous method being used. At this vaccination no immediate unfavorable results were noted in the native cows. Practically all the Holstein cattle, however, showed anaphylactic shocks of greater or lesser degree. In fact, the reactions were so violent in some cases that fatal termination seemed imminent, but by careful observing each animal, the administration of sedatives and antispasmodics as the symptoms in individual cases indicated, complete recovery was brought about in every case.

Concerning these reactions some correspondence was carried on with the manufacturers of the vaccine, and they pointed out the desirability of sensitizing the animals with 1 c.c. of serum two hours before the injection of the regular dose, and stated that it was their belief that this would remedy the difficulty.

The vaccination for the present year was administered to the native cows in January. These were treated in two different lots, the milk cows being vaccinated first and the dry cows about ten days later.

Inasmuch as no anaphylaxis had previously been observed in the native animals, the first vaccination was carried out without the sensitizing dose. Shortly before the work was completed it was noted that reactions were beginning to appear. About 20 per cent of the animals were affected to a greater or less degree. One cow died from the shock. The remainder survived, but many were very extensively affected. No remedial measures were used to overcome the reactions.

The second lot of native cows received 1 c.c. of serum as a sensitizing dose two hours before the regular vaccination. In this lot also about 20 per cent showed reaction, although no fatalities occurred. While the visible manifestations of the reaction were quite as marked in these animals as in those not sensitized, the constitutional symptoms were not so severe. It is interesting to note that fully 5 per cent showed mild reactions upon the injection of the 1 c.c. of sensitizing serum. The subsequent vaccination was carried out upon these animals the same as the others with no more pronounced reactions in those that showed slight preliminary results than in others which did not receive the preliminary injection.

The unfavorable results with the hardy native cows caused considerable apprehension as to what might occur in the Holstein cattle, possessed of a more highly organized nervous system in addition to their higher value which rendered extreme caution advisable.

The Chief of the Board of Health Laboratory suggested that perhaps more favorable results might be obtained if a smaller dose of serum were used for desensitizing purposes, normal salt solution being used for a diluent as is done in human practice. Accordingly on March 4, 1921, three dry Holstein cows were selected for vaccination with injections of diluted and undiluted sensitizing doses. The results are shown in Table 1. It will be noted that the dilution of the sensitizing dose was not instrumental in reducing the reaction in one case. The animal receiving pure serum and the one receiving one-third serum and two-thirds normal salt did not react.

TABLE 1.—FIRST EXPERIMENT
(Sensitizing dose given at 8:30 a.m., regular vaccination dose at 10:30 a.m.)

Animal No.	Sensitizing Dose	Temperature at regular intervals						Remarks
		8:30	9:30	10:30	11:30	12:30	1:30	
M.I. 400.	1 c.c. serum only	102.2	102.2	102.3	102.4	102.1	102.6	No reaction
103721 . .	1 c.c., one-half serum, one-half normal salt	101.8	102	102.4	102.6	102.2	102.6	Violent reaction
Gor. 110.	1 c.c., one-third serum, two-thirds normal salt	103	103.1	103	103.2	102.8	103	No reaction

In order to determine this point more fully, about 10 days later 10 more dry Holstein cows were selected and treated in like manner. Table 2 illustrates the results. It will be noted that an anaphylactic reaction does not materially alter the temperature. The table shows that diluting the sensitizing dose had practically no effect upon the reaction so far as we were able to determine. Cows sensitized with all three kinds reacted.

THE REACTION

From our observation an anaphylactic reaction in cows is one affecting the nervous system primarily. The manifestations arising as the reaction progresses are directly referable to an exaggerated nervous irritability. Usually the first symptom of the reaction is that the animal rubs the muzzle against the nearest

TABLE 2.—SECOND EXPERIMENT
(Sensitizing dose given at 8:30 a.m., regular vaccination dose at 10:30 a.m.)

Animal No.	Sensitizing Dose	Temperature at Regular Intervals						Remarks
		8:30	9:30	10:30	11:30	12:30	1:30	
103395	1 c.c., one-third serum, two-thirds normal salt	102.2	102.4	102.4	102.4	102.6	102.4	No reaction
103766	1 c.c., serum only	101.8	102	102.2	101.6	102	102	Reaction came on at 11:30. Extreme nervousness and salivation. No pimpling. Subsided at 1:30
103663	1 c.c., one-third serum, two-thirds normal salt	101.6	101.8	101.6	102	102.1	102.1	Reaction came on at 2 p.m. Pimpling and slight salivation. Reaction not severe. Subsided at 3:30
103773	1 c.c., one-third serum	102	102	102	102	102.2	102.2	No reaction
103791	1 c.c., serum only	100	101	101	101.2	101.4	101.5	No reaction
103562	1 c.c., one-half serum, one-half normal salt	102.6	103	103	103	103	103.3	Reaction came on at 11:30. Salivation, swelling of vulva, pimples. Subsided at 1:30
103778	1 c.c., one-half serum, one-half normal salt	102.2	102.4	102.4	102	102.2	102.4	Reaction came on at 12 m. Salivation, swelling of vulva, pimples. No extreme nervousness. Subsided at 2 p.m.
103718	1 c.c., serum only	102.8	102.8	103.2	103	103	103	No reaction
103770	1 c.c., serum only	102	102	102	101.6	102	102	No reaction
103570	1 c.c., one-half serum, one-half normal salt	101	101	101.6	101.8	102	102.2	Very slight reaction

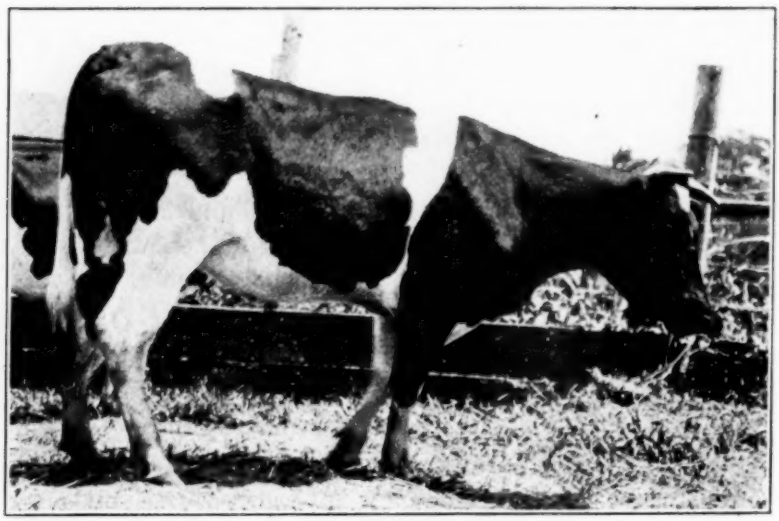
available object. This is soon followed by salivation and lacrimation. Distention of the nostrils and swelling of the superficial veins, especially about the face, soon appear. There is jugular pulse and contraction of the muscles of the hair follicles giving rise to the so-called staring coat. This is followed by an extensive pimpling over the entire surface of the body, generally beginning on the sides of the neck,

During this time the animal becomes more and more restless; lies down for a moment then gets up; periodic bellowing is also noted. Swelling of the eyelids and external genitalia are later manifestations and are usually the last to subside. In exaggerated cases straining is noted, very similar to that during labor. There is a temporary paralysis of the pharyngeal muscles, the mouth is held open with the tongue protruding and moving from side to side. Distention of the rumen follows that condition, and unless other measures are applied recourse to the trocar is necessary. From the throat there is seen a bloody, gela-

Salivation and pimpling of the neck and face. Veins swollen.

tinous discharge, becoming hard and cartilaginous upon exposure to the air. This discharge seems to consist of desquamated epithelial cells. Frequent defecation and loose watery feces supervene. The breathing is rapid and shallow.

The reaction is not constant in all animals either at the time of its appearance after the injection of the serum, in its duration, or in the time it takes to subside. We have noted reactions beginning to appear within 30 minutes in some cases while in others it did not appear until 2½ hours after injection. Some cases began to subside within an hour and a half, while others persisted for 3 to 4 hours before subsidence set in. All the cases



Pimpling over entire body surface

did not show all the manifestations of the reaction. While some showed all the symptoms enumerated, others were lacking in one or more, and they were by no means constant.

POSSIBLE SEQUELÆ

We are not in a position at the present time to state positively that there are any serious after-effects from this reaction. Following the last two vaccinations we have noted an unusually large number of abortions in the native cows. These abortions began to appear in from 10 days to 2 weeks after vaccination, reached the maximum in about 6 weeks, gradually diminished and finally disappeared in 3 to 4 months. It is interesting to note, however, that the larger percentage of abortions occur at about the same period of gestation.

Following the abortions in 1920 it was thought that there might be a high temperature reaction which would account for them. The last vaccinations were checked in this regard, and the table of temperature submitted does not seem to bear out this supposition. Nevertheless in this year as well as last our abortion curve for the entire herd has shown a decided rise following vaccination by this method in those cattle which showed a reaction of more or less severity.

TREATMENT

During revaccination of a herd that has been previously treated by this method it is well to watch carefully and treat the symptoms as they appear. No fixed set of prophylactics seems to be advisable. In those cases of extreme nervous irritability we have used adrenlin chloride 1 dram and atropin 1½ to 2 grains with very favorable results.

Where straining and distention of the rumen occur, the administration of antispasmodics is recommended. Hyoscin, morphin and cactoid compound (veterinary) hypodermically has given good results in our hands.

CONCLUSIONS

1. Anaphylactic reactions are liable to appear in cattle vaccinated against anthrax from year to year by the serum-simultaneous method. A lapse of 18 months or more between vaccinations has no effect upon the possibility of a nonreaction.

2. There is no means which we have found for determining which animals will react and which will not.

3. The administration of a sensitizing dose of 1 c.c. of serum two hours before the regular vaccination may reduce the severity of the reaction, but it will not prevent reactions in those animals that are susceptible.

4. An anaphylactic reaction in cattle is not accompanied by a rise in temperature.

5. Generally speaking, reactions of quite a severe nature will eventually subside without treatment, but in valuable animals treatment of the more violent symptoms is recommended.

6. While there is evidence that the reaction may produce abortion, further investigation upon this point is desirable.

VETERINARIAN APPOINTED FOR CHARITY HOSPITAL BODY

For the first time in the history of the New Orleans Charity Hospital a veterinarian has been appointed to the department of pathology, Dr. W. J. Ratigan having been selected for the post. Dr. Ratigan's duties will include animal vaccination for the Pasteur treatments sent out from the Charity Hospital Pasteur Institute.

Since leaving the Army Veterinary Corps a few months ago, Dr. Ratigan has also received the appointment of veterinarian to the New Orleans Police Department and the New Orleans Zoological Garden. He promises to furnish our readers several interesting case reports relative to caged animals.

PRESIDENT HARDING MAY TAKE TO SADDLE

President Harding may take to the saddle for exercise when cool weather comes again, riding through the parks of Washington as a variation from golf, his only present outdoor diversion.

Brig. Gen. Sawyer, his physician, has recommended the change, but the President, though fond of riding when a younger man, has not been in the saddle for some years and has fixed no date for his first venture. However, it is understood that Wayne Dinsmore has become deeply interested in the proposition and has offered to provide the finest saddler available.

THE PREVENTION OF INTESTINAL WORMS IN PIGS

By B. H. RANSOM, *Chief, Zoological Division*

Bureau of Animal Industry, Washington, D. C.

DAMAGE DONE BY WORMS

THE COMMON intestinal roundworm (*Ascaris lumbricoides*) is one of the most injurious of the various kinds of parasites that infest the pig. It causes digestive troubles, retards growth and development, and in other ways interferes with the well-being of pigs, especially the younger animals. Furthermore, recent scientific investigations have shown that this parasite can cause a great deal of damage otherwise than merely as an intestinal parasite. It has been proved that in its early stage of development in the pig, while still too small to be seen by the naked eye, it travels in the bloodstream to the lungs and then back again to the intestine by way of the windpipe and esophagus, this curious journey requiring about 10 days for its completion, after which the young worm settles down in the intestine and grows to maturity in about two and a half months. If many of the young worms take this trip at the same time, as often happens, the injury that results is likely to be serious.

THUMPS

The pig often shows symptoms commonly known as thumps, and may die of pneumonia. Many cases of thumps are caused by worm infection. Pigs that survive a severe invasion of the lungs by the young worms frequently do not fully recover and fail to grow and develop at a normal rate.

YOUNG PIGS MOST SUSCEPTIBLE

Investigations and experiments have also shown that pigs are most susceptible to infection and suffer most seriously from the infection during the first few weeks of life. As they grow older they become more resistant.

SOURCES OF INFECTION

Pigs become infected by swallowing the eggs of the parasite which are microscopic size and are found in the manure of infested hogs or upon and in the soil of places that have been occu-

pied by infested hogs and hence contaminated by their droppings. It has been estimated that one full-grown female worm in the intestine of a hog may produce as many as 80,000,000 eggs. The eggs as they are passed out of the body of the hog in the droppings are not at first infectious, but in a few weeks or months, depending upon the weather and various other conditions, the egg reaches a stage of development at which it contains a tiny worm within its shell, and is then ready to be swallowed. The eggs are very resistant to cold weather and drouth, they are not killed by most chemical disinfectants, and are very long-lived (some may live as long as five years). Not all adult hogs harbor intestinal worms even though exposed to infested soil; commonly, however, the parasites may be found in one out of three hogs of breeding age. These worms are also not uncommon in human beings, especially children, in some localities.

From the foregoing it is evident that the soil of places occupied by hogs is likely to be heavily laden with the eggs of intestinal worms and it is readily understood, in view of their food habits, how pigs kept in such places may become infested with large numbers of the worms. Worm-infested places are especially dangerous for young pigs. It is largely on account of worm infection that so many young pigs are lost or fail to grow properly when reared under ordinary methods of hog management.

DEVELOPMENT OF A SYSTEM OF PREVENTING INFECTION

Upon a basis of the results obtained from laboratory study and experiments on a small scale a system of raising pigs to avoid worm infestation, or rather to reduce the amount of infestation to a point at which it will cause little or no damage, has been worked out by the United States Bureau of Animal Industry. Through the cooperation of the Farm Bureau and public-spirited hog raisers of McLean County, Ill., this system has been tested out on a considerable number of farms. The results of these trials have been so successful that the system is becoming well established in that county. With reference to this portion of the history of its development it has been called the McLean County System of Hog Sanitation. It has been found that the system not only prevents losses from worms, but also more or less completely prevents various diseases that may be termed filth diseases, such as bull-nose, sore mouth and certain forms of diarrhea. It is not to be depended upon as a preventive of hog cholera, hence when

this system is followed hog-cholera immunization should be still continued in accordance with approved methods of hog-cholera control.

THE MCLEAN COUNTY SYSTEM

Essentially the so-called McLean County System consists in handling young pigs from the time of birth until they are several months old in such a manner as to avoid or reduce to a minimum the chances of infection with worms, in other words, to keep young pigs entirely away from old hog lots or other places that have been much exposed to fecal contaminations.

SPRING PIGS

Farrowing Pens.—Before farrowing time the farrowing pens, which should be of sanitary construction, are thoroughly cleaned. All the litter is removed and the concrete and wooden floors and sides of the pens are scrubbed with boiling water and lye. The heat of the water (if applied liberally and very hot) is destructive to worm eggs and the lye helps to remove the dirt. The indoor pens are shut off from the outside pens which are commonly built in connection with permanent hog houses. These outside pens are not to be used by the sows and pigs. If the building is not artificially heated the cleaning should be done in the autumn before freezing weather as it may be found almost impossible to clean the pens properly during the cold weather of early spring or late winter.

Sows.—The sows are placed in the clean pens a few days before farrowing, but not until the mud and dirt that is usually present on their skins has been removed. The udder particularly should be well washed with soap and water. If this precaution of cleaning the skin of the sows is not taken they are liable to carry with them into the farrowing pens a multitude of worm eggs and other disease germs found in the soil of the hog yards, so that even with the first few mouthfuls of milk the new-born pigs may swallow hundreds, thousands, or possibly millions of worm eggs and germs of disease.

After farrowing, the sow and pigs are not allowed out of the farrowing pen until they are taken to pasture. The sow and her litter, in a few days to two weeks after farrowing, are removed to pasture by means of a double crate (one compartment for the sow, the other for the pigs) on a sled which may be backed up to the door of the pen and hauled away with a team of horses.

Pastures.—A special pasture for the sows and young pigs is provided. This should not be a permanent pasture which has been much used by hogs and thereby more or less badly contaminated by their droppings, but a field that has been under cultivation and sown at the proper time to a suitable forage crop. Legume pastures available in the normal course of crop rotation may be utilized, devoting a different field each year to this purpose. Individual shelter houses for each sow and her litter are provided in the pasture, and water is supplied by piping or by tanks replenished by hauling water to them. No other hogs should have access to this pasture, nor should the pigs be allowed to run back from the pasture to the barn lot or hog yards. They are thus kept away from contaminated places until they are at least four months old, or until they weigh about 100 pounds, after which they are little likely to suffer seriously from worm infestation even though exposed to infection.

If there is much difference in the ages of the various litters, the pigs should be placed in several pastures according to age, or the one pasture may be subdivided. Mixing together pigs of widely different ages commonly results in the younger ones being robbed by the older ones, so that they do not have a fair chance to get the nourishment they need for proper growth. Temporary shade may be built in the pasture if natural shade is not available. Care should be taken to keep the bedding in the shelter houses in a clean and sanitary condition. Some hog raisers move the shelter houses from time to time and burn the old bedding. The location of the feed ground should be shifted occasionally, the surroundings of the water supply maintained in a sanitary condition, and the development of mud wallows prevented as completely as possible.

FALL PIGS

In the case of fall pigs (if not farrowed too late) the same system may be followed with slight modifications. The permanent farrowing house need not be used. If the sows have been running on pasture and are not encrusted with mud and filth they may be transferred directly, without washing, to the special pasture, and the farrowing done in the individual houses in this pasture. In regions not too far north the pigs (if farrowed at the very beginning of the autumn season or at the end of summer) will be old enough to be past the age of greatest susceptibility to

worm infection before it is necessary to put them in winter quarters that are likely to be more or less contaminated.

PERMANENT HOG LOTS AND FEED YARDS DANGEROUS

Whenever possible it is desirable to have yards that are much used by hogs so arranged that a change can be made every year or two to fresh ground, ploughing under the surface infection on the old ground, sowing a crop and allowing a firm surface to become re-established before using it again for hogs. Hog yards, in any case, should be selected with the view of securing proper drainage, and of being able to keep them in a sanitary and cleanly condition, as free as possible from the common type of mud wallow which usually soon becomes a reservoir of concentrated infection with various verminous and bacterial diseases. It is nearly always feasible to replace mud wallows at comparatively slight expense with shallow concrete wallowing tanks so constructed as readily to be maintained in a sanitary condition. As shown in Farmer's Bulletin 1,085, such a tank can also be used as a means of applying remedies for lice and mange.

From what has been said as to the occurrence of the worms under discussion in children, it is obvious, although they usually do not come into such intimate and continuous relations with the soil as pigs, and hence are not so likely to become badly infected, that children on the farm, particularly young children, should not be permitted to play in places that have been exposed to infection either from pigs or human beings.

Professor O. Rubeli, of the Veterinary School, Berne, Switzerland, has prepared three excellent charts, with 10 colored figures, showing the structure of the udder of the cow. Such charts are invaluable in connection with the teaching of dairy science, especially the diseases of the udder. The anatomical preparations from which these charts have been made were given the gold medal at the Swiss National Exhibition held in Berne in 1914.

The following Canadian and American veterinarians have been elected honorary fellows of the Central Veterinary Society of Great Britain: Dr. Frederick Torrance, Veterinary Director General, Montreal; Dr. C. D. McGilvray, Principal Ontario Veterinary College, Toronto; Lieut.-Col. D. S. Tamblyn, Calgary, Alberta; Prof. W. L. Williams, Cornell University, Ithaca, N. Y.

STUDIES ON THE SHEEP STOMACH WORM—HAEMONCHUS CONTORTUS RUD.[1]

By J. E. GUBERLET

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THE STOMACH-WORM DISEASE is an old and ever-present problem for the sheep industry throughout many parts of the world. Its presence has been frequently reported from many parts of Europe (Germany, France, Austria, England and Scotland), Asia, Africa (South Africa), Australia, New Zealand and South America. In the United States nearly every State has reported its presence to be more or less severe. The parasites causing the disease are nematodes which attack cattle, sheep, goats and other ruminants. Their habitat is usually the fourth stomach, or abomasum, although they may occasionally be present in the small intestine.

EFFECT ON HOST

The injurious effect of these parasites upon the host is twofold, perhaps threefold. First, the loss of blood which these worms extract from the host; second, toxic substances excreted by the parasites, which are absorbed by the host animal and which have a destructive action upon the blood; third, slight abrasions are produced in the mucous membrane lining the abomasum which may allow certain bacteria to enter the system of the host.

LIFE HISTORY OF PARASITE

The life history of *Haemonchus contortus* is direct and has been demonstrated by Ransom (1906), Veglia (1915) and others, as well as by the writer. The eggs of the parasites leave the host through the feces, and if deposited under favorable conditions they hatch in a short time. With continued favorable conditions they moult once or twice, after which they reach the infectious or ensheathed larval stage. This usually requires about a week or ten days. At this time the larvæ show a tendency to migrate upward and crawl upon blades of grass or upright objects. When

[1] Contribution from Parasitological Laboratory of the Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma. Presented before the American Society of Zoologists, Chicago, Ill., Dec. 29, 1920.

they have reached a position well upon a blade of grass or other vegetation they are in a favorable position to be taken into the stomach of a grazing animal, such as a sheep or other ruminant. After gaining entrance to the stomach of a suitable host the larval worms complete their development in about three weeks (18 to 25 days).

RESISTANCE OF EMBRYOS

The control of these worms as a pest is a difficult problem on account of the remarkable resistance of the ensheathed embryos to adverse conditions. They may be in a dried-up condition for long periods of time and upon the addition of moisture become active again. Repeated freezing and thawing does not materially affect them. Ransom (1908) found larval worms to live more than nine months in culture. Veglia (1915) found ensheathed stomach worms to live in water for more than five months. The writer on two occasions observed larval worms to live in cultures of soil and feces for over eight months, and in one extreme case two living larvæ were found in a culture of soil and feces after a period of nearly 16 months. The eggs in this case were placed in the culture July 23, 1919, and the two remaining larvæ were found November 18, 1920. In this instance the larvæ were so sluggish and in such a depraved condition that they undoubtedly would not have been able to continue development had they gained entrance to an adult host. Under field conditions where the factors of temperature and moisture are important considerations it is probable that most stomach-worm larvæ do not ordinarily survive much longer than eight or ten months and still retain enough vitality to continue development if taken up by a proper adult host.

TREATMENT

Various methods of treatment for the removal of stomach worms from sheep have been tried. Several remedies have been used for a number of years with fairly good results. Among these was copper sulphate. This was first used by Hutcheon (1892, 1895) in South Africa, who reported its successful use in many cases. Later, copper sulphate was used by Stiles (1901), Ransom (1907), Hall and Foster (1918) and others with comparatively good results.

The writer has treated several hundred sheep for the removal of *Haemonchus contortus*. Copper sulphate, copper sulphate and tobacco, and intramuscular injections of cacodylate of so-

dium were used in the treatment of the animals. Copper sulphate in a 1 per cent solution, as recommended by the Bureau of Animal Industry, at the rate of 50 c.c. for lambs under one year and 100 c.c. for sheep over one year, was found to be 75 to 95 per cent effective. The efficiency of the anthelmintic was determined both by microscopic examination of feces for eggs and by autopsies. Most of the data were obtained through microscopical examination of a definite amount of feces before and after treatment and finding the percentage of reduction of the eggs. A number of sheep were also placed in pens with concrete floors, where an accurate count was made of the worms passed. Later the lambs were slaughtered and the alimentary canal examined for the presence of worms.

A solution containing 1 per cent copper sulphate and 1 per cent tobacco infusion was found to have an efficiency of 90 to 100 per cent. This was administered in the same amount as given for copper sulphate alone. Over 600 treatments were given with this remedy, which proved to be highly satisfactory. The data were obtained in the same manner as for the other method. The use of tobacco and copper sulphate proved very efficient in removing the tapeworms and hookworms as well as the stomach worms. With a single exception, every animal treated, known to be infested with cestodes and hookworms, and later autopsied showed none of these parasites to be present.

Copper sulphate alone removed some of the tapeworms, but does not seem to be as effective as with the tobacco added. Tobacco infusion (1 to 2 per cent, 50 to 100 c.c.) was used to treat a few lambs, and its efficiency was found to be very variable. In some cases it removed as high as 75 per cent of the stomach worms, while in others it removed only 15 to 20 per cent. However, tobacco undoubtedly possesses valuable anthelmintic properties when combined with copper sulphate.

In treating a flock of sheep it was found advisable to give two treatments three or four days apart, because it was found that there are always a few animals that do not respond to treament as well as the rest. In order to make sure that the flock is comparatively free from parasites the double treatment should be given. Ordinarily a single treatment removes the most of the worms. One interesting point was noted in the treatment of some lambs. These were given treatment and the eggs were reduced to a certain number. Three or four later treatments failed

to reduce that number. The animals were then slaughtered and upon examination of the alimentary tract it was found that no worms were present in the fourth stomach, but there were a few in the posterior portion of the small intestine, apparently unaffected by the action of the anthelmintic.

Intramuscular injections of cacodylate of sodium at the rate of 7 grains for an adult sheep were given to several sheep for the removal of stomach worms. The dose was repeated on alternate days until three or four doses had been given. Since *Haemonchus contortus* is a blood sucker it was thought that the worms could be poisoned by means of the arsenical preparation. However, the results were all negative from these trials.

SEASONAL DISTRIBUTION

Haemonchus contortus has a periodic seasonal distribution, appearing in the late spring or early summer and disappearing in the fall and winter. This undoubtedly comes about in the spring when sheep or other ruminants are placed in infested pastures and become infested through grazing. In the fall of the year, when animals are changed from pastures to feed yards and are fed forage crops, they are not being reinfested and a few worms are gradually being lost. The nature of the food is undoubtedly responsible for a loss of some of the worms from the host.

A number of infested animals were taken from a pasture and some were slaughtered at once. Upon examination of the alimentary tract it was found that there were no stomach worms in the intestine. Several days later the rest of the animals in this group were killed. When the alimentary tract was examined it was found that there were a large number of the worms present in the intestine—in one animal almost 200 worms were in the intestine. During the interval between the removal from the pasture and the time of slaughtering the animals had been fed on rather coarse hay and oats. It seems that the worms are gradually but not always entirely eliminated from the host during the winter season, and the fact that they are present in the intestine in such large numbers so soon after the change of feed makes it seem evident that the nature of the food is an important factor.

COMPARISON OF EGGS AND WORMS

During the course of some experimental work and observations on *Haemonchus contortus* an attempt was made to estimate the number of adult worms in the host from the number of eggs in the droppings. A number of sheep were used for this work. Different amounts of freshly passed feces were weighed out and washed by being passed through a series of sieves. The eggs were then counted from each amount on a microscopic slide. It was observed that fasting, constipation and diarrhea affected the number of eggs in a definite amount of feces. After making a large number of fecal examinations and after an average of the eggs from certain amounts was taken, the animals were slaughtered. When the alimentary tract was examined it was found that the number of eggs in 1 gram of feces collected from a sheep in a normal condition agreed fairly well with the number of adult female worms in the host. It was discovered that there were 1½ to 2 times as many females as males present in the host. Hence, from that an estimate can be made of the number of adult stomach worms in the host.

The writer wishes to express his appreciation to Dr. L. L. Lewis, of the Veterinary Department, Oklahoma Agricultural and Mechanical College, Stillwater, for advice and many valuable suggestions which he has kindly offered during the course of this work.

SUMMARY

1. The stomach worm disease is a serious menace and causes great losses to the sheep industry.

2. This disease has been known among sheep raisers for many years and is generally distributed throughout the world.

3. Sheep and other animals infested with stomach worms suffer from loss of blood and from the destructive action of toxins which are secreted by the parasite and absorbed by the blood.

4. The life history of *Haemonchus contortus* is direct. The eggs hatch on the ground and moult in a few days, after which they reach the infectious stage, when they migrate upon grass, where they are eaten by grazing animals. Upon gaining entrance to the stomach of a suitable host animal they reach maturity in about three weeks.

5. Mature stomach worm larvæ are very resistant to adverse

conditions and may live in soil or water or on vegetation for several months.

6. Animals may be successfully treated for the removal of stomach worms with a 1 per cent solution of copper sulphate and tobacco.

7. Stomach worms have a seasonal distribution in animals, appearing in the spring or early summer and disappearing in fall and winter. This is undoubtedly due to the grazing on infested pastures in spring and the feeding of dry forage crops in fall and winter.

8. The number of adult worms in sheep can be estimated by the number of eggs in 1 gram of droppings.

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From the growth of a crop of lettuces on his lawn a Bangor man discovered that it had been sown with lettuce seed in mistake for grass seed. This is a common occurrence, and the usual remedy is to sprinkle the lawn with salad dressing and have it grazed over by a flock of vegetarians.—*London Punch.*

EXPERIMENTAL TREATMENT OF CATTLE TO PREVENT OX WARBLE INFESTATION

By MARION IMES

Veterinary Inspector, Zoological Division, U. S. Bureau of Animal Industry, and

F. L. SCHNEIDER

Inspector in Charge, U. S. Bureau of Animal Industry, Albuquerque, New Mexico

INVESTIGATIONS carried on during recent years by Hadwen and others have shown that the larvæ of ox warble flies (*Hypoderma lineatum* and *H. bovis*) gain entrance to the body by penetrating the skin at the roots of the hairs on which the adult flies deposit their eggs. The larvæ migrate to the esophagus, and later to their final location beneath the skin of the back where they form the well-known swellings with openings to the exterior, through which the larvæ emerge when the parasitic stage of their development is completed. Hadwen's studies have shown that the regions of the body on which the flies deposit their eggs are limited in extent. The hairs of the legs are favorite locations for egg deposition. As a means of control or eradication, systematic extraction of the warbles during the season at which they can be discovered beneath the skin of the back has given good results in some localities, especially in Denmark, where on some farms warble infestation has been reduced almost, if not quite, to the point of disappearance. This method of control is not always easily applicable, particularly in the case of cattle which are not under close restraint. The experiments discussed in the present paper were undertaken in order to determine whether repeated applications during the fly season of insecticidal or fly-repellent substances to the skin of cattle, particularly to the legs, would prevent the appearance of grubs beneath the skin of the back, or reduce their number if infestation were not altogether prevented. Prior experiments in dipping and spraying cattle with various insecticides during the season at which the grubs are found beneath the skin of the back had failed to demonstrate the feasibility of destroying the grubs by such

treatment after they had established themselves in the back. The only apparent remaining plan of attack by insecticidal treatment therefore was to seek to prevent egg deposition, or to destroy the eggs and larvæ before the latter could enter the skin; in other words, to apply fly-repellent or insecticidal substances to the skin of the animals during the fly season sufficiently often to insure a continuous or nearly continuous fly-repellent or insecticidal action.

EXPERIMENTS ON CORRALLED CATTLE

Ten head of native New Mexico range cows of various ages, extremely emaciated and all grossly infested with ox warble grubs, were selected for experimental treatment and were placed in a corral near Albuquerque, New Mexico, January 10, 1920. The corral was about one-half acre in extent and the animals were not stabled but held under natural conditions of subjection to ox warble infestation. The cattle were all in one corral and were classified in groups or lots and marked so each lot could be identified.

The plan of the experiment included three methods of treatment: 1, application of protective treatment to the entire body surface, including the legs; 2, application of medicaments to the legs only, leaving the body surface untreated; 3, treatment of the feet and lower parts of the legs by causing the animals to pass through shallow vats or wading tanks charged with medicated liquid.

Treatment of the cattle was commenced prior to the known seasonal appearance of warble flies in that locality and continued until after the disappearance of the flies. The first treatment was given January 20, 1920, and the last one September 20, 1920. Following the completion of treatment the animals were held in the corral until January 31, 1921, in order that examinations might be made at frequent intervals to determine the effects of the several methods of treatment.

The wading tanks used in the experiment were constructed of concrete and were 8 feet long, 2½ feet wide and 1 foot deep. When in use the medicated liquid in the tank was maintained at an approximate depth of 9 inches.

The essential data of the results of the experiments on the corralled cattle are arranged in the accompanying table.

Cow No. 1, age 10 years, was sprayed with used automobile cylinder oil. The spray was applied to the entire body surface,

Results of Experiments on Corralled Cattle.

Cow No.	Medicament used.	Method of Application.	Date of first Application	Interval between Applications (days)	Date of last Application	Number of warbles developed	Remarks.
			1920		1920		
1	Used automobile cylinder oil	Animal sprayed	1–20	7	9–20	56	Twice weekly until May 16, then once weekly
2	Do.	Legs only sprayed	1–20	2	9–20	0	
3	Do.	Wading tank	1–20	1	9–20	1	Treated daily
4	Coal-tar creosote, 2%	Animal sprayed	1–20	2	9–20	6	
5	Do.	Legs only sprayed	1–20	3	9–20	5	
6	Do.	Wading tank	1–20	1	9–20	0	Treated daily
7	Fly repellent	Applied on legs only	1–20	1	9–20	3	Treated daily
8	Waterglass (sodium silicate)	Do.	1–20	3	9–20	7	
9	None (check lot)	Untreated	....	....	....	21	
10	Do.	Do.	....	....	....	32	

including the legs. The operation was repeated twice weekly until May 16, when, on account of hot weather and the depleted physical condition of the animal, the period between applications was extended to one week.

During the experiment the animal suffered more or less constant depilation over a major portion of the body and legs and the skin of the legs over the flexures showed considerable cracking. These lesions, however, did not extend into the soft tissues or deeper layers of the skin to any marked extent. Used automobile cylinder oil usually contains more or less kerosene and gasoline, as these substances are used for washing the crank cases and allowed to flow into the same container as the used oil. In this case it was observed that the oil liberally applied as a spray caused considerable irritation to the skin of the animal.

The cow showed warble nodules under the skin on December 5 and they rapidly increased in number until January 5, at which time 56 warbles were counted in the animal. At the close of the experiment, January 31, the number of grubs in the cow's back had decreased to 20.

Cow No. 2 received application of used automobile cylinder oil in the form of a spray to the legs three times a week. The oil caused some irritation to the skin of the legs but not sufficient to cause any apparent effect on her general health. The cow was held under observation until January 31, but no warbles could be found at any time during the period of observation.

Cow No. 3 passed through a shallow wading tank daily during the experiment. The wading tank contained water to a depth of

about eight inches, carrying approximately a one-inch layer of used automobile cylinder oil. The animal suffered no apparent ill effects from the treatment. One warble appeared in this animal December 27 and remained throughout the period of observation. No other warbles were detected at any time.

Cow No. 4 was treated with a two per cent aqueous solution of coal-tar creosote dip, the entire body surface, including the legs, being sprayed three times each week. The animal remained in good thriving physical condition throughout the experiment. It was observed that the cow was not annoyed by flies as much as were the other cattle in the same inclosure. The record of observations shows that two grubs were found in the cow December 27. January 10 four warbles were detected and on January 15 a total of six grubs were found, this being the greatest number found in the cow at any examination.

Cow No. 5 was treated by having the legs sprayed every three days with a two per cent solution of coal-tar creosote dip, care being taken to see that the remainder of the body received none of the spray. December 15 showed one warble and nine days later a total of five grubs were found, this being the greatest number found in the cow during the period of observation.

Cow No. 6 passed through a wading tank daily. The tank was charged with a two per cent solution of coal-tar creosote dip to a depth of about eight inches. At first the animal was reluctant to enter the wading tank, but after becoming accustomed to it she would often voluntarily enter and remain standing in the liquid until driven out. At no time during the period of observation following treatment could any grubs be found in the cow.

Cow No. 7 was treated by coating the legs with a known fly repellent containing the following ingredients: Carbolic acid and turpentine, each one-half ounce; pine tar and fish oil, of each three ounces, and cottonseed oil sufficient to make 16 ounces. The mixture was applied about every three days except during rainy weather, when it often was necessary to make applications every day. The medicament proved to be a complete success as a fly repellent, as flies would not go near the areas of skin coated with the mixture. One warble was found in the cow's back December 15. A total of 3 warbles were found in the cow December 27. At the close of the experiment only two grubs remained in the animal.

As a corollary to the experiment with cow No. 7 efforts were

made to protect the skin of the legs of cow No. 8 so as to prevent mechanically the entrance of warble-fly larvæ through any part of the areas of skin covered with the protective coating. A five per cent aqueous solution of waterglass or sodium silicate was used, on the assumption that during the evaporation of the water contained in the solution the sodium silicate might remain as a continuous film or glass-like deposit over the skin and hair. Upon close examination following the initial application this condition seemed to exist, but experience demonstrated that the coating did not persist indefinitely, and it was necessary to repeat the application about every three days. The waterglass distinctly stiffened the skin to an extent that it caused cracking over the flexures of the joints and considerable inflammation around the affected areas. December 27 the cow showed a maximum of seven grubs, the largest number found at any time. January 31 only three of the seven grubs remained in the host.

Cows Nos. 9 and 10 were control animals which received no treatment of any kind. No. 9 showed a total of 21 warbles on January 10 and No. 10 a total of 32 on January 15, these being the maximum numbers for the control animals.

EXPERIMENTS ON OPEN RANGE CATTLE

Methods that may be satisfactory for handling and treating small herds of cattle held in fenced inclosures are not always applicable without modification to wild range cattle. Consequently in planning the experiments on control of ox-warble infestation it was considered advisable that part of the series be conducted under actual range conditions. During the early part of the winter of 1920 arrangements were made to construct concrete wading tanks and conduct experiments on the C. T. Turney cattle ranges in southeastern New Mexico and also on the W. O. and H. B. Hall cattle ranges in Sierra County, New Mexico. These field trials were conducted under the immediate supervision of Dr. H. E. Kemper, who was supervising scabies eradication work for the Bureau of Animal Industry in that section at the time the experiments were made.

The wading tanks were constructed in gateways through which the cattle were in the habit of passing to reach their watering places. All other passageways were closed so the animals could not get to the watering places without passing through the concrete wading tanks.

The inside dimensions of the wading tanks were as follows: Turney tanks, No. 1, length 10 feet, including entrance and exit inclines, width 7 feet, depth 9 inches; No. 2, length 10 feet, width 10 feet, depth 9 inches. W. O. Hall tank, length 10 feet, width 6 feet, depth 12 inches. H. B. Hall tank, length 12 feet, width 6 feet, depth 10 inches.

Both of the Hall vats proved to be a failure from the beginning, as the wild range cattle would not go near them after they were charged with water and crude oil. Upon completion of the two vats on the Turney ranch they were filled with water and crude oil and a few cattle walked into the vats and stood in them with apparent enjoyment. It was then thought that the remainder of he herd would walk through the vat, but contrary to expectations they would not do so, and remained outside until they were nearly famished for water. Other gates had to be made so the cattle could get to water without passing through the wading tanks.

Range cattle usually are suspicious and timid about approaching man-made structures or anything that may have the appearance of a trap. However, as they readily enter natural mud holes and shallow water, it seems probable that wading tanks could be so camouflaged that range cattle would voluntarily pass through them.

CONCLUSIONS

1. All treatments used in the experiments, with the exception of that applied to cow No. 1, materially lessened or apparently prevented ox-warble infestation. In the case of cow No. 1 treatment was given only once a week after May 16.

2. Comparing the preparations used, the two per cent solution of coal-tar creosote dip was the most effective in preventing infestation.

3. The results of the wading tank method of treatment as practiced on cows 3 and 6 indicate that the method may prove of great practical value.

4. The experimental data indicate that cattle having their legs protected below the knees and hocks by the application of insecticidal or fly-repellent substances during the fly season have few if any grubs during the following winter.

5. If on further trial the wading tank method of applying treatment proves to be effective in controlling ox-warble infestation, it seems very probable that suitable adaptations can be devised to meet practical requirements in treating range cattle.

STATISTICAL OBSERVATIONS ON THE ABUNDANCE OF NEMATODE PARASITES IN THE SHEEP OF PENNSYLVANIA [1]

By HOWARD CRAWLEY

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DURING the year 1920 the Pennsylvania Bureau of Animal Industry undertook to make a survey of the State with regard to the incidence of intestinal parasites in the sheep of the State. Questionnaires were sent out to the breeders of sheep within the State, and to each breeder who answered the questionnaire was sent a pint tin can, with the request that it be filled with feces from the flock and returned to the laboratory. It is with the results of the examination of this material that the present paper is concerned.

In all, 135 cans of feces were received. The methods of fecal examination are so well known that it is hardly necessary to give the procedure in detail. It is perhaps well to state, however, that for the sake of having the results uniform, precisely the same procedure was followed in all cases. It may also be worth noting that the same amount of sediment was throughout examined under the microscope for eggs, this consisting of three preparations each containing a quantity of the material covered by a seven-eighth inch square cover glass.

At the very outset a difficulty was encountered. While the nematodes of sheep are sufficiently well described in the literature that a diagnosis can be made from the worm itself, this is not the case for the eggs. Where the eggs are mentioned at all, the author has usually contented himself by saying that they are oval or ellipsoidal, and that they vary in length between two given figures, and in breadth between two others. Further, such figures as have been published usually fail to give much of an idea of the actual egg. In consequence the matter of the assignment of the eggs found to the worms from which they had come had to be worked out.

At the same time, most of the eggs found readily fall into

[1] Contributions from the Bureau of Animal Industry, Pennsylvania Department of Agriculture—New Series, No. 5.

groups. These groups may be distinguished by size, shape, thickness of shell, and in some cases by the stage of development. In the beginning of the study each such group was designated by a letter, and when or if it was possible to determine to which worm the egg belonged, the name was substituted for the letter. It is not yet possible in all such cases to make a positive diagnosis, but it fortunately happens that the eggs of the two most important of the nematode parasites of sheep, the stomach and nodular worms, can be told from one another and from all of the other eggs which occur.

There were two eggs, A and C of the original designations, which so far cannot be assigned. Of these, the A egg is large, giving an average measurement, based on 114 specimens, of 162 by 78 microns. The extremes were 194 and 137 for the length and 86 and 67 for the breadth. These eggs are ellipsoidal in shape, not oval or ovoid, the ends being broad and bluntly rounded. Ransom (U. S. Bureau of Animal Industry, Bulletin 127) says that the eggs of *Ostertagia marshalli* are from 160 to 200 microns long by 75 to 100 microns broad. It may, therefore, be that these A eggs belong to this species.

The C eggs range from a symmetrical ellipse in outline to an egg that is best characterized as wedge shaped. That is, one end is broad and blunt, the sides then tapering to the opposite narrow rounded end. In most cases, they contained a doubled-over embryo. The average size, based on 28 specimens, was 83 by 40 microns. It has not yet been possible to identify this egg, and it may indeed be that more than one species is included under this designation.

In the material from a considerable number of flocks, there was found a broad egg with blunt ends. It was generally ellipsoidal, at times almost sub-cylindrical. It was noted, while making the routine examinations, that eggs of this type tended to fall into two groups, different somewhat in size and shape. But when only a few of the eggs were found, it was difficult or impossible to say to which group they belonged. In consequence they were all placed together as D eggs. It was later discovered that two worms actually were involved, these being *Bunostomum trigonocephalum* and *Chabertia ovina*.

In addition, of the nematodes, there were found the eggs of *Haemonchus contortus*, *Œsophagostomum columbianum*, *Trichuris ovis*, *Capillaria* sp., and *Gongylonema scutatum*. Nat-

urally, also, other eggs were at times encountered, but those given above make up all of which records were kept.

It is necessary to call attention to one point. The eggs of *Nematodirus* were not found, yet the worm itself is present in Pennsylvania sheep, as the laboratory records show. The failure to find it is doubtless due to the fact that the finest meshed sieve used held back the eggs of this genus, a discovery which was unfortunately not made until most of the material had been handled. The following list gives the number of times each of these several eggs were found, it being understood that in all material from 135 flocks was examined. Tapeworm eggs are also included.

	Times	Percentage
Oesophagostomum columbianum	87	64
Bunostomum trigonocephalum and *Chabertia ovina*	71	53
Haemonchus contortus	56	41
Ostertagia circumcincta	54	40
"A" eggs	17	13
"C" eggs	16	12
Capillaria sp.	16	12
Gongylonema scutatum	14	10
Trichuris ovis	10	7
Moniezia sp.	16	12

It is to be kept in mind that the above figures are minimum. One pint of feces from a flock of say 50 sheep cannot be regarded as thoroughly representative, it being readily understandable that material from many of the sheep was not included.

In addition, an examination of only three small drops of the sediment from a pint of material cannot, in its turn, be looked upon as thorough, for the amount of material examined under the microscope was only a very small fraction of that obtained from the pint of feces. In routine examinations of this sort, however, a high degree of precision cannot be attained.

Nevertheless, some rather interesting numerical results were obtained. In a particular flock of 67 sheep, which was amongst those heavily infested, 136 eggs were counted, of which 106 were of the nodular and 14 of the stomach worms. If it be allowed that only one five-hundredth part of the sediment from the pint of feces was examined, there probably were 53,999 nodular worm and 7,000 stomach worm eggs present in this one pint of material. How many pints of feces are discharged by a flock of 67 sheep in a day is a question, but it is clear that the numbers here given should be multiplied by this factor in order to obtain the extent of the daily contamination of the pasture occupied by the flock under consideration. It is therefore easy to see how the infestation of the animals is spread.

STUDIES ON THE USE OF ANTHELMINTICS IN FOWLS

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THE past two or three years have been marked by a revival of parasitological studies, dealing particularly with the parasites of domestic animals, and it is only natural that their generic reclassification and revision of nomenclature should be followed by investigations into the life histories of many helminths and as a sequence a determination made of the comparative anthelmintic value of the various drugs recommended as specifics. Previous to that time it was taken for granted that certain preparations were very efficient, and this assumption was largely based upon traditional beliefs, fostered from year to year by various publications which were, in the main, compilations.

It is only reasonable to expect, and naturally so, that during this recent revival the larger breeds of domestic animals such as the horse, cow, pig, sheep, etc., should receive the major portion of attention, as their greater economic value clearly indicated such a course. Lately, however, more attention has been given to intestinal helminthiasis of fowls, and much commendable work has been done on the life histories of nematodes and cestodes and the efficacy of anthelmintics in the eradication of these parasites.

Guberlet (2) has carried on a special investigation of the life histories of various types of American tapeworms of fowls, embracing studies of the transmission and prevention of cestode infection in chickens. He has reported very favorable results following the administration of concentrated lye in the feed.

Hall (5) has expended considerable effort on a determination of the anthelmintic value of various tænicides in the treatment of infested animals, many contributions on the subject appearing in the various scientific journals.

Salmon (9), in his bulletin on "The Diseases of Poultry," says:

"One of the best methods of treating tapeworms in fowls is to mix in the feed a teaspoonful of powdered pomegranate root bark for every 50 head of birds. In treating a few birds at a

time it is well to follow this medicine with a purgative dose of castor oil (2 or 3 teaspoonfuls). According to Zurn, powdered areca nut is the best tapeworm remedy for fowls, but he states that turkeys are unfavorably affected by it. It may be given in doses of 30 to 45 grains mixed with butter and made into pills. Male fern is also a very effective remedy and may be used in the form of a powder (dose 30 grains to 1 dram) or of liquid extract (dose 15 to 30 drops)."

Gage and Opperman (1) advocate the use of turpentine and Epsom salts and have found this a very effective remedy in nodular tæniasis.

Neumann (7), quoting from Zurn and others, recommends the various drugs mentioned in the quotation from Salmon.

Pearl, Surface and Curtis (8) likewise recommend similar treatments to those outlined by Salmon.

Gallagher and Foster (3) recommend oil of chenopodium, 10 to 12 drops given in a teaspoonful of castor oil.

Gallagher and Ward (4), quoting from various references, specify such drugs as pomegranate root bark, male fern, areca nut, etc.

Kaupp (6) recommends the same treatments as indicated above, with the addition of thymol.

Ransom (10), in the Bureau of Animal Industry Report for 1904, mentions various drugs, including most of those already listed in the foregoing paragraphs.

For years our Department had been advocating the use of pomegranate root bark, 1 teaspoonful for every 50 birds, our advocacy being based upon the recommendations contained in the various works then available. Little attention was paid to the ultimate results, as it was rarely possible to supervise the treatment or obtain statistics relative to its efficacy. Occasionally a report of improvement would be recorded, but this apparent improvement was judged by the general appearance of the fowls and the fact that they seemed to be picking up. We venture to assert that the noticeable improvement was dependent, in the majority of cases, upon the precautionary measures taken to prevent reinfection.

With a knowledge of the unsatisfactory status of the remedies, and the lack of definite statistics for comparison, it was decided to undertake at the first apportunity a study of the various drugs recommended. This opportunity came during an outbreak amongst the fowls on the Experimental Farm, Ottawa,

when the young stock became heavily parasitized and a number of deaths followed a gross infestation with tapeworms.

A number of cockerels, pullets and capons were selected for experimentation, and divided into separate lots. These birds were decidedly unthrifty and showed all the symtoms of fowls harboring parasites.

Although a number of autopsies had previously been made, to be absolutely sure that we were dealing with cases of internal parasitism two fowls from the experimental flock were killed and opened to determine the degree of infestation and the species of worms present. In both these birds the small intestines were thickened and inflamed, showing evidence of a catarrhal enteritis, and in the duodenum hundreds of tapeworms of almost microscopic size (*Davainea proglottina*) were noted. The small intestines also contained large numbers of *Choanotaenia infundibuliformis* and one or two large nematodes (*Heterakis perspicillum*). In the ceca dozens of small nematodes (*Heterakis papillosa*) were observed. Besides the species above noted, a number of threadworms (*Capillaria retusum*) were demonstrated.

EXPERIMENT 1

October 24, a pullet which was received from a poultryman in Ottawa and came from premises that had previously been shown to harbor infection was fasted 24 hours and was then given 1½ grains of pomegranate root bark plus ½ grain of calomel. This pullet was killed 18 hours afterwards and the bowel was carefully opened under tepid water. *Davainea proglottina* was present in large numbers, alive and very active.

EXPERIMENT 2

November 1, a flock of 15 fowls, comprising an equal number of cockerels and capons were fasted 24 hours and were then each given 1½ grains of pomegranate root bark plus ½ grain of calomel. Twenty-four hours later one capon died. Autopsy: Numerous cestodes (*Davainea proglottina*) present in duodenum, and a fair number of microscopic roundworms (*Capillaria retusum*) present throughout the small intestines. When immersed in tepid water 8 hours after the death of the fowl these worms still showed signs of activity.

EXPERIMENT 3

November 1, a flock of 15 fowls comprising an equal number of cockerels and capons were fasted 24 hours and were then each

given 3 grains of pomegranate root bark plus ½ grain of calomel. One of these birds died 20 hours afterwards, probably due to gross infestation and the action of the drug. Autopsy: Numerous cestodes *Davainea proglottina* present in duodenum. Microscopic roundworms (*Capillaria retusum*) present in large numbers throughout the small intestine. These parasites were alive and very active when the bowel was immersed in tepid water.

EXPERIMENT 4

November 13, a single capon was fasted for 24 hours and was then given 3 grains of pomegranate root bark. Three hours afterwards 1 teaspoonful of magnesium sulphate was administered to this bird. The droppings were washed in water in large, shallow pans, and to the naked eye did not contain any proglottides. Forty-eight hours later this capon was killed and upon examination large number of cestodes *Davainea proglottina* and a few *Dicranotaenia sphenoides* were observed, which upon immersion in tepid water showed great activity. This capon was one of the birds used in Experiment 2, making the second dose of pomegranate root bark.

EXPERIMENT 5

November 13, a single pullet was fasted for 24 hours and was then given 3 grains of pomegranate root bark. Three hours later she received a teaspoonful of magnesium sulphate. No examination of the droppings was made. This pullet was killed 48 hours afterwards and upon autopsy presented a fair number of active tapeworms (*Davainea proglottina*).

EXPERIMENT 6

November 15, a pullet was fasted for 24 hours and was then given 4½ grains of pomegranate root bark plus 2 grains of calomel. Forty-eight hours afterwards this bird was killed. Autopsy: Numerous cestodes (*Davainea proglottina*) present in duodenum; microscopic roundworms (*Capillaria retusum*) present throughout the small intestines. These parasites were very active when immersed in tepid water.

EXPERIMENT 7

November 19, five capons were fasted, as usual, for 24 hours and were then each given 6 grains of pomegranate root bark. Three hours afterwards each of these fowls received a teaspoon-

ful of magnesium sulphate. One capon died a few hours later and upon autopsy was found to be grossly infested with cestodes (*Davainea proglottina* and *Choanotaenia infundibuliformis*), alive and active. One capon was killed 48 hours later and upon examination showed hundreds of tapeworms (*Davainea proglottina*) and a large number of *Choanotaenia infundibuliformis*. These parasites were very active when immersed in tepid water. These five capons were from the lot used in Experiment 3, making the second dose of pomegranate root bark.

EXPERIMENT 8

November 18, four capons and eight miscellaneous fowls were fasted for 24 hours and were then given a teaspoonful of concentrated lye in a gallon of mixed grain, boiled for 1 hour. The fowls ate this mixture very gingerly at first but eventually ingested sufficient to fill their crops completely. Twenty-four hours later one capon was killed for examination and upon autopsy showed active tapeworms (*Davainea proglottina* and *Choanotaenia infundibuliformis*). These parasites were present in smaller numbers than in the fowl examined in the preceding experiment.

EXPERIMENT 9

November 27, the fowls mentioned in Experiment No. 8 were again fasted and then given 1 teaspoonful of concentrated lye in a gallon of mixed grain boiled for 1 hour. Droppings collected and examined during the next 24 hours failed to show segments or entire worms. Upon autopsy one pullet showed numerous active tapeworms (*Davainea proglottina*).

EXPERIMENT 10

November 30, four capons were given a decoction of pumpkin seeds. The seeds were cut into very small portions and after boiling in a limited amount of water to soften them slightly were cooled and placed before the fowl, which had been previously fasted for 24 hours. Two of the capons ate liberal quantities of the material, which principally consisted of chopped seeds, while the other two birds partook of a very small amount. Collection and examination of the droppings during the next 24 hours failed to reveal any proglottides or entire worms. No autopsies were made in this instance.

EXPERIMENT 11

December 3, the four capons mentioned above in Experiment No. 10 were each given 1 teaspoonful of magnesium sulphate in the mash.

December 4, these four birds were given a dose of 1 teaspoonful of turpentine plus 1 teaspoonful of sweet oil.

December 5, these fowls were given a final dose of magnesium sulphate, 1 teaspoonful to each.

December 7, two of these capons were killed for examination. Autopsy, Bird No. 1: Intestine contained no large tapeworms (*Choanotaenia infundibuliformis*), but numerous active *Davainea proglottina* were present. Autopsy, Bird No. 2: Intestine almost free of tapeworms, although 2 large cestodes (*Choanotaenia infundibuliformis*) were found, which upon immersion in tepid water failed to show signs of life. The result in this instance was rather confusing, as good effects in the latter case may have been due to the pumpkin-seed decoction.

EXPERIMENT 12

December 19, three capons and two pullets were fasted for 24 hours and were then given 15 capsules containing approximately 30 grains of powdered areca nut.

December 20, each fowl was given 1 teaspoonful of magnesium sulphate.

December 21, two strobilæ of the tapeworm (*Choanotaenia infundibuliformis*) were found in the droppings.

December 21, 1 pullet was killed and upon autopsy 4 active tapeworms (*Choanotaenia infundibuliformis*) were observed, firmly attached to the small intestine. No *Davainea proglottina* could be demonstrated.

EXPERIMENT 13

December 27, two capons, fasted for 24 hours, were each given 30 grains of powdered areca nut. These were two of the birds used in Experiment No. 12, making a second dose of areca nut. No examination was made of the droppings. Autopsy, Bird No. 1: Intestine did not contain tapeworm of any variety. A few microscopic roundworms (*Capillaria retusum*) were present. Autopsy, Bird No. 2: An examination of the intestines showed two attached scolices of *Choanotaenia infundibuliformis* and a few active *Davainea proglottina*, also a few microscopic roundworms (*Capillaria retusum*).

EXPERIMENT 14

January 7, four assorted fowls, fasted for 24 hours, were each given 30 grains of powdered areca nut.

January 12, one fowl was killed for examination. Autopsy: No large cestodes, but hundreds of *Davainea proglottina* present, firmly attached and very active.

EXPERIMENT 15

January 15, two birds, fasted for 24 hours, were each given 60 grains of powdered areca nut, followed in 24 hours by 1 teaspoonful each of magnesium sulphate.

January 24, these two fowls were again each given 60 grains of powdered areca nut, followed by a dose of magnesium sulphate. No physiological effect was noted in these birds from either dose of the drug.

January 25, both birds were killed for examination and upon autopsy showed a fair number of tapeworms (*Davainea proglottina*) and a few *Choanotaenia infundibuliformis*.

EXPERIMENT 16

January 7, four assorted fowls, fasted for 24 hours, were each given 1 grain of thymol.

January 8, a teaspoonful of magnesium sulphate.

January 12, one fowl killed for examination. Autopsy: No large cestodes, but hundreds of *Davainea proglottina* present, firmly attached and very active.

EXPERIMENT 17

January 15, two birds, fasted for 24 hours, were each given 6 grains of thymol.

January 24, these fowls were again each given 6 grains of thymol, followed by a dose of magnesium sulphate.

January 25, one of these fowls was killed and upon autopsy showed large numbers of tapeworms (*Davainea proglottina* and *Choanotaenia infundibuliformis*), also 1 large nematode (*Heterakis perspicillum*).

EXPERIMENT 18

January 15, two fowls, fasted for 24 hours, were each given 2 drams of fluid extract of male fern.

January 24, these birds were again given 1½ drams of fluid extract of male fern.

January 25, one of these fowls was killed and upon autopsy showed *Davainea proglottina* and *Choanotaenia infundibuliformis* present in enormous numbers, which when immersed in tepid water showed signs of great activity. No physiological effect followed the administration of this drug.

DISCUSSION OF RESULTS

The results of the various treatments and our ultimate conclusions may be subject to criticism in that the results are not worked out on a percentage basis of efficiency, but when dealing with cestodes in chickens it must be remembered that many of the types are almost microscopic in size and can only be clearly observed after immersion in tepid water.

Ransom in his treatise on "The Tapeworms of American Chickens and Turkeys" states: "The diagnosis by hunting in the droppings for segments of the parasite is less satisfactory than would be supposed, for it is not rare to find chickens badly infested with tapeworms when it has been impossible to discover segments in the manure. The method is rendered doubly uncertain because the color of the segments is about the same as the urine in the feces."

In some cases a careful washing of the droppings was made to determine the percentage of efficiency, but this was subsequently discontinued, as the proglottides of the cestode *Davainea proglottina* were very hard to detect, the worm being very friable and breaking up into separate segments.

The only way one could estimate the numbers of *Davainea proglottina* present would be to employ some device such as a bacterial counter over the open bowl immersed in tepid water or by utilizing a warming stage and a square field ocular.

While some of the drugs showed some anthelmintic value, the number of worms found on autopsy discounted their use as effective tænicides in fowls.

The drugs and preparations were freshly procured, which would dispose of any argument relative to their deterioration.

In summing up our experiments the following conclusions appear to be admissible, although a large number of autopsies would have provided more indisputable evidence:

1. Pomegranate root bark can not be relied upon as an effective tænicide in fowls.

2. Areca nut, making allowance for degrees of infestation, can

SUMMARY OF ANTHELMINTIC TREATMENTS

Exp No.	Drugs and Chemicals Used	Dose	Number of treatments	Number of Fowls treated	Number of Fowls autopsied	Results
1	Pomegranate root bark	1½ grains	One	1 pullet	1 pullet	Numerous active tapeworms present
2	Do.	1½ grains	One	15 cockerels and capons	1 capon	Do
3	Do.	3 grains	One	15 cockerels and capons	1 capon	Do., also threadworms (*Capillaria*)
4	Do.	3 grains	Two	1 capon	1 capon	Numerous active tapeworms present
5	Do.	3 grains	One	1 pullet	1 pullet	Fair number of active tapeworms
6	Do.	4½ grains	One	1 pullet	1 pullet	Numerous active tapeworms present, also thread worms (*Capillaria*)
7	Do.	6 grains	Two	5 capons	2 capons	Numerous active tapeworms present
8	Concentrated lye	1 teaspoonful in 1 gallon of grain	One	4 capons and 8 miscellaneous fowls	1 capon	Fair number of active tapeworms present
9	Do.	Do.	Two	3 capons and 8 miscellaneous fowls	1 pullet	Numerous active tapeworms present
10	Pumpkin seeds	Chopped seeds ad lib.	One	4 capons	None	
11	Turpentine	1 teaspoonful	One	4 capons	2 capons	Bird No. 1, numerous active tapeworms present; Bird No. 2, two large inert tapeworms found
12	Areca nut	30 grains	One	3 capons and 2 pullets	1 pullet	Four active tapeworms present
13	Do.	30 grains	Two	2 capons	2 capons	Bird No. 1, no tapeworms found; Bird No. 2, few tapeworms and roundworms present
14	Do.	30 grains	One	4 assorted fowls	1 fowl	Hundreds of tapeworms present
15	Do.	60 grains	Two	2 fowls	2 fowls	Both birds showed a fair number of tapeworms
16	Thymol	1 grain	One	4 fowls	1 fowl	Hundreds of active tapeworms present
17	Do.	6 grains	Two	2 fowls	1 fowl	Numerous active tapeworms and one large nematode present
18	Fluid extract of male fern	2 drams	Two	2 fowls	1 fowl	Hundreds of active tapeworms present

not be considered as absolutely reliable, because, although experiments 12 and 13 would indicate a beneficial action, experiments 14 and 15 clearly discount the result.

3. Thymol is apparently inefficient as a tænicide, even when administered in larger doses than usually recommended.

4. Fluid extract of male fern, given in exceedingly large doses, failed to have any effect on the tapeworms present in the intestines.

In regard to the other preparations mentioned, viz., turpentine, concentrated lye, pumpkin seeds and oil of chenopodium, no expression of opinion is given, as further studies with these remedies are necessary before a definite pronouncement can be made.

Finally, we would like to point out that although the parasites listed as being present are scientifically designated, the classification, while probably correct, is nevertheless tentative and subject to revision.

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Dr. T. A. Sigler, recently with the Missouri Valley Serum Co. and located at Indianapolis, has resigned and returned to his practice at Greencastle, Ind. It is reported that Dr. Sigler has now fully recovered his health, after having undergone several abdominal operations.

Dr. Adolph Eichhorn, Veterinary Director of the Lederle Laboratories, was a recent visitor to the Capital City, where he renewed old friendships both within and without official life.

THE RELATIONSHIP BEWEEN BOVINE AND HUMAN TUBERCULOSIS[1]

By R. M. Olin, M. D.

Commissioner, Michigan Department of Health

"THERE is as much chance of getting tuberculosis from cows as getting hog cholera from ham and eggs." This amazing statement was made at a meeting of Michigan business men—made in all seriousness. Other speakers reached similar conclusions that evening. This occurrence affords, we believe, sufficient justification for addressing your conference on the relationship of bovine to human tuberculosis and reviewing the extensive literature on this subject. Much of this material is dull and unsensational, but its introduction is necessary to prove beyond doubt the intimate connection between tuberculosis in cattle and in the human being.

Our impression is that the work of eradicating tuberculous cattle is worth while purely from a commercial standpoint, without reference to the prevention and spread of disease in men, women and children. Recent cattle tuberculin tests in Michigan show that 2.44 per cent of cattle are positive reactors. This percentage is considerably lower than that in all the other States except Wisconsin, and the credit for this excellent showing is the result of your organized effort. The 2.44 per cent means that there are still many thousand tuberculous cattle in the State. Every day these infected cows must be spreading the disease to other animals and transmitting it to their offspring. Eradicating them will save the lives of other cattle and save a considerable amount of money that farmers are now losing because of animal tuberculosis. The economic features of the campaign, alone, would seem to justify its existence.

The problem of human infection from cattle has been the subject of years of tireless research on the part of many observers. Even before the discovery of the tubercle bacillus, the probability that tuberculosis in man and animals was the same disease was suggested by Villemin, in 1865. Shortly after Koch's remarkable discovery—the finding of the tubercle bacillus or germ which

[1] Presented at the Short Course of Instruction on Tuberculosis and Hog Cholera, Michigan Agricultural College, East Lansing, Mich., June 23, 1921.

causes the disease—Ravenel, your great agricultural bacteriologist, and Theobald Smith began pioneer work on the relationship between tuberculosis in man and animals. Smith believed that a bovine and a human type of the tubercle bacillus existed and that these types were distinct enough to warrant more extensive investigation. The problem was soon undertaken by numerous workers, agricultural boards and commissions, both in this country and in Europe. (In 1901, Koch, the discoverer of the tubercle bacillus, made the statement that the bovine germ is seldom responsible for disease in man. This since disproven saying brought forth a storm of criticism.) Of the many workers in the field, the most important contributions have been made by the British Royal Commission and by Park and Krumwiede in this country. Our discussion is based on the results of their endeavors.

The problem is well stated in the British Royal Commission's final report as follows:

"1. Whether the disease in animals and man is one and the same.

"2. Whether man and animals can reciprocally be infected with it.

"3. Under what conditions, if at all, the transmission of the disease from animals to man takes place."

Before answering these questions, it is necessary to review the bacteriology of the two types, to establish firmly the fact that the human and bovine types of the tubercle bacillus are clearly differentiated groups, and that the laboratory can tell us conclusively whether a given germ is of the human or the bovine strain.

Both types look identical under the microscope—short, scarlet rods which can not be differentiated in this manner. On certain artificial media—cultures—their character of growth shows very decided differences. The human organism grows rapidly and luxuriantly on these selected substances; the bovine slowly and sparsely, or not at all. This distinction is permanent; the bovine does not exhibit the human growth appearance and characteristics, even after long artificial cultivation and after passage through laboratory animals.

In animals there is a decided contrast in the behavior of the two types. Rabbits inoculated with bovine bacilli rapidly develop generalized tuberculosis and die within a few weeks. When human bacilli are used there is no marked reaction other than

the formation of a localized abscess at the site of injection. Calves are likewise very susceptible and rapidly become severely afflicted when they are inoculated with the bovine organism. They are immune to attacks by the human organism. Cats and rats are immune to the human bacillus. The higher animals, those which most nearly resemble man—chimpanzees and monkeys—are susceptible to both the bovine and human forms.

Rabbits have now become the standard laboratory animal for differentiating human from bovine tubercle bacilli. Park's conclusions on the growth of the two forms are now used as a standard means of differentiation:

"The bovine type of tubercle bacillus in every instance causes a generalized tuberculosis in doses of 0.01 milligram intravenously, the tuberculosis being progressive and causing the death of the animal. Human viruses injected in the same amount produce no disease at all or lesions of varying severity in the lungs or kidneys or both, never causing a progressive generalized tuberculosis."

The above detail is admittedly tedious. It has, we hope, fulfilled its purpose, in recalling definitely to your minds that the human and bovine types of the tuberculosis germ are distinct forms, quite as distinct as different races of human beings. Their growth characteristics and the manner in which they affect the animals into which they are injected distinguish the two types. It should be added that the above sketchy information is the briefest possible summary of years of earnest scientific work.

Granted that we have these two types of tuberculosis germs, a human and a bovine type, what are their differences in relation to human disease? How does this laboratory procedure affect ourselves and our children?

None of the many investigators have been able to produce generalized disease in cattle with human bacilli. The converse, as we have already explained, is not true. The bovine bacillus does cause disease in higher animals and in man.

It is obviously impossible to inoculate men directly with bovine tuberculosis germs. The scientists have proven this point by taking the organisms found in many and varied forms of tuberculosis in the human being and showing by the manner we have summarized whether the given organism is of the human or the bovine variety. All have found that most of the tuberculosis of neck glands and of the abdomen and skin is caused by the

bovine bacillus. Rarely the bovine bacillus has been found to cause consumption in the adult.

The final summary of the Park-Krumwiede experiments embraces their own and the work of many other individuals. Their figures show clearly how dangerous the bovine organism is as a source of infection in man.

Percentage Incidence of Bovine Infection (Park and Krumwiede)

Diagnosis	Adults 16 Years and Over	Children 5 to 16 Years	Children Under 5 Years
	Per cent	*Per cent*	*Per cent*
Pulmonary tuberculosis	0.4	0	2.8
Tuberculous adenitis, cervical	2.7	38	61
Abdominal tuberculosis	20	53	58
Generalized tuberculosis, alimentary origin	14	57	47
Generalized tuberculosis	0	16	8.6
Generalized tuberculosis including meninges, alimentary origin	0	0	66
Tubercular meningitis (with or without generalized lesions other than preceding)	0	0	4.6
Tuberculosis of bones and joints	3.3	6.8	0
Tuberculosis of skin	23	60	0

Fatality Percentages of Bovine Infections (Park and Krumwiede)

Diagnosis	Children 5 to 16 Years	Children Under 5 Years
	Per cent	*Per cent*
Abdominal tuberculosis	75	77
Generalized tuberculosis, alimentary origin	57	46
Generalized tuberculosis	20	7.2
Tubercular meningitis, secondary to tuberculosis of alimentary origin	0	66
Tubercular meningitis (other than preceding)	0	5.4
Total percentages	26	18

These figures are based on the bacteriological analysis of 1,511 cases.

The tables bring out clearly the following facts: Seventy-five per cent of gland cases in children are bovine; 66 per cent of generalized tuberculosis in children is bovine; 18.2 to 26 per cent of deaths from tuberculosis in children are caused by the bovine bacillus.

Park finally concludes that about 10 per cent of all tuberculosis in children from 5 to 16 years is bovine. The British Royal Commission figures are much higher, namely, 37.5 per cent under 5 years of age; 29.5 per cent from 5 to 10 years; 14.6 per cent from 10 to 16 years.

It is the lesson these figures teach, and not the figures themselves, that we wish to impress upon your minds. Statistics are too often meaningless numbers.

To summarize: The bovine and human tuberculosis germs are separate and distinct individuals. The bovine organism can and does cause disease in the human being. It is a real menace to the children of Michigan. By wiping out the tuberculous cattle throughout the State we can save the lives and prevent the maiming of thousands of boys and girls. Our duty is one of cooperation. By eradicating tuberculous cattle, you will play a most important role in the stamping out of the great white plague, a disease with which one Michigan citizen in every hundred is afflicted.

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NOTES FROM URUGUAY

The Rural Society of Uruguay is preparing to erect a monument to the "gaucho" (cowboy), and has invited competitive proposals from sculptors. Booklets setting forth the conditions of the contest have been sent to the Pan-American Union in Washington for distribution among American sculptors who may be interested.

Foot-and-mouth disease has broken out in the Department of Rio Negro, and the sanitary authorities have declared a temporary quarantine on that department. It is said, however, that the quarantine will not be applied to uninfected herds even though they are located within the quarantined zone.

The Tanners' Council has donated $10,000 to a fund of $40,000 for the purpose of removing grubs from cattle in an entire county in New York State. It hopes ultimately to destroy the pest.—*Farm and Ranch.*

THE SUBCUTANEOUS TUBERCULIN TEST[1]

By C. A. CARY

State Veterinarian, Auburn, Alabama

THE MOST common or approved method of applying the subcutaneous tuberculin test is as follows:

1. Secure the cattle in separate stalls or by chains, ropes or stanchions, so as to confine them in fixed places, and then number, tag or mark them for temporary or permanent identification.

2. Take pre-injection temperatures two hours apart, at least three times. Better take pre-injection temperatures once every two hours, from 6 a. m. to 6 or 10 p. m.

3. In all normal animals inject 3 to 10 c.c. of standard subcutaneous tuberculin at 6 or 10 p. m.

4. Begin taking post-injection temperatures not later than eight hours after time of injection. For animals that have been repeatedly tested or have previously been given large doses of tuberculin it is better to begin taking temperatures not later than four hours after injection (for early reactors). Continue the regular two-hour temperatures until the eighteenth or twentieth hour after injection. When no regular reaction appears and the temperature rises to 104 or higher at the sixteenth or eighteenth hour post-injection, continue taking temperatures up to the twenty-fourth or twenty-eighth hour (for late reactors).

5. Give the same care, feed and water both days, and avoid sudden changes of any kind. At no time give heavy feeds, large quantities of water, or produce excitement or exercise.

6. Interpret the clearly, carefully and accurately recorded rec ords as follows:

(a) A regular or typical reactor is one where the post-injection temperatures make a more or less definite curved rise of temperature for three or more readings and the maximum of the curve is two or more degrees higher than the maximum preinjection temperature.

Example: Pre-injection, (1) 101, (2) 101.4, (3) 101.8. Post-injection, (1) 102, (2) 103, (3) 104.2, (4) 105, (5) 104.1, (6) 103.

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[1] Presented at the Tuberculosis Eradication Conference, Atlanta, Ga., May 2-4, 1921.

(b) When the temperatures are high and level or nearly equal for 3 to 7 post-injection records. This may be regarded as a reactor.

Example: Pre-injection, (1) 101.4, (2) 101.8, (3) 102. Post 1, (1) 104.4, (2) 104.8, (3) 104.8, (4) 104.4, (5) 104.6. Post 2, (1) 105.1, (2) 105, (3) 105.4, (4) 105.2, (5) 106.

(c) An early reactor will begin rise in temperature in two to four hours after injection and will not always show a normal or big curve.

Example: (1) Post-injection, second hour, 104.5; fourth hour, 105; sixth hour, 105; eighth hour, 104; tenth hour, 102. (2) Post-injection, second hour, 104; fourth hour, 104.2; sixth hour, 104.1; eighth hour, 103.4; tenth hour, 101.

(d) A late reactor may start up at the fifth, sixth or seventh reading (sixteenth, eighteenth or twentieth hour post-injection).

Examples: Post-injection 1, (1) 101.2, (2) 101.4, (3) 101, (4) 102, (5) 101.8, (6) 104, (7) 105, (8) 105.2, (9) 104.8, (10) 103. Post-injection 2, (1) 101.4, (2) 101.6, (3) 102, (4) 101.8, (5) 102, (6) 103.5, (7) 104, (8) 105.1, (9) 104.2, (10) 102.8.

(e) When there are up and down temperatures, irregular curves, the test may be more or less questionable and the animal is marked suspicious, unless cold drinks of water or sudden exercise or excitement may account for the sudden fluctuations of temperatures, and then it is usually best to mark them as suspicious.

Example: Pre-injection, (1) 102, (2) 101.2, (3) 102.2. Post-injection, (1) 102, (2) 104, (3) 101.2, (4) 104.2, (5) 103, (6) 102, (7) 103.

(f) When the curve is low and does not have a maximum of two degrees above the maximum pre-injection temperature, then make the animal a suspect, and give it an ophthalmic test or wait 90 or more days and retest with intradermal and ophthalmic.

Example: Pre-injection, (1) 101.6, (2) 102, (3) 101.4. Post-injection, (1) 101.5, (2) 101.6, (3) 102.8, (4) 103.2, (5) 103.6, (6) 102.2.

(g) Always note the physical changes in the reacting animals. Some have a brief chill, the hair stands up and the coat is dry and rough, and some get very thirsty and refuse feed. Some may have a cough, a discharge from the nose and enlarged lymph glands. Some have tubercles in the udder. The local changes at point of injection must be observed.

The quantity of standard tuberculin to inject varies with the size, age, and number of the previous injections. If the cattle have never been injected, 4 to 6 c.c. is sufficient for the large cattle and 2 to 4 c.c. for the small and young cattle. There is no doubt about a tuberculous animal becoming tolerant or plugged by frequent small or large doses. A very large dose (10 to 15 c.c.) of tuberculin will often bring forth a reaction in a plugged or tolerant animal, but it is not always certain or positive. As a rule tolerant animals react early and some react exceptionally late. In order to stop owners from plugging animals it is important that all tuberculin production and sales shall be licensed and controlled by Federal and State authorities.

Temperatures taken before and after injection are very important. The Federal and State regulations specify at least three pre-injection and at least six post-injection temperatures two hours apart running to the eighteenth hour post-injection and beginning not later than the eighth hour post-injection. Where every animal is normal and the course is typical this method will catch many or nearly all of the tuberculous animals, but it will not catch the early and late reactors so often found in herds that have been tested several times by the subcutaneous method.

To my mind we should go back to the old-time original method of taking temperatures. Begin at 4 or 6 a. m. and take pre-injection temperatures every two hours until 6 or 10 p. m. Inject at 6 or 10 p. m., and begin at 8 p. m. or 12 midnight and take temperatures every two hours to the twentieth or twenty-eighth hour after injection. When this method is carefully and accurately done, there will be very few mistakes and very few tuberculous animals missed in the test. It may take more time and attention but it pays in accuracy. The morning pre-injection temperatures can be compared with the morning post-injection temperatures. The same is true with afternoon temperatures. Hence the common daily variations give opportunity for a more accurate comparison, with same hours each day.

The good points about the subcutaneous method are:

1. The numerous data from which to draw conclusions, numerous temperatures, conditions of animals, etc.

2. In non-plugged animals it is very accurate.

3. It keeps the veterinarian on his job and gives him a chance to note and see clearly any physical reactions that appear.

4. It is easily carried on in combination with the ophthalmic method.

The objectionable points are:

1. It is more exacting in work, and often takes day and night work.

2. It should cost more on account of more work for the veterinarian and the use of more tuberculin.

3. It takes about as much time to test one animal as it does for ten.

4. It is more or less unreliable in plugged animals or animals that have been repeatedly tested by this method.

5. It can not be applied to young calves or to wild cattle.

NEW STATE VETERINARIAN IN OHIO

Dr. Bruce Edgington has been appointed State Veterinarian of Ohio and director of the State Serum Plant, succeeding Dr. T. A. Burnett. Dr. Edgington has for the past six years been director of the State Serum Laboratories at Reynoldsburg, Ohio, and this duty has now been combined with that of the State Veterinarian.

In Dr. Edgington's appointment the veterinarians of Ohio and those interested in the proper sanitary laws of Ohio livestock feel that their most signal victory has been won. It will please veterinarians everywhere to know that Dr. Edgington was appointed without seeking the place and without the backing of a single politician in Ohio. Governor Davis and Director of Agriculture E. L. Taber gave much conscientious thought to the selection of one for this important position, assuring the profession all along that professional ability, personality and executive capacity alone would be considered. Needless to say the profession in Ohio generally is pleased.

Dr. Edgington is an alumnus of the Chicago Veterinary College, 1907, and the Ohio State University, 1912. From 1907 to 1910 he was engaged in active practice at Mount Sterling, Ohio.

Dr. W. A. Hagan has resigned his position in the Veterinary School at Cornell University and is now connected with the Rockefeller Institute, at Princeton, N. J.

THE OPHTHALMIC TUBERCULIN TEST[1]

By A. J. DeFosset, *Montpelier, Vermont*

THE COMPLETE eradication of tuberculosis from some herds of cattle in the Eastern States would seem almost a hopeless task were it not for the efficacy of the ophthalmic test. Remarkable progress has been made in Vermont in the control and eradication of the disease, in that many herds have been brought under State and Federal supervision. The dairyman and the breeder have confidence in our methods, and the fundamentals of control rest entirely with their hearty cooperation. Each has become thoroughly familiar with the difficulty of our task and is looking forward as eagerly toward a clean herd as he is to an accredited herd. To many of these men a clean herd means one in which each member is capable of passing an ophthalmic check test.

A large number of reactors have been removed from herds under supervision during the past two years by the use of the subcutaneous method, and many herds have apparently been rid from every trace of disease by this method. There are, however, some herds in which infection continues to persist, even after these herds have succeeded in passing one or more clean tests by the subcutaneous method. Some of these cases have become so conspicuous in certain localities that herd owners demand the ophthalmic check test to detect diseased members. These check tests have been applied with great success.

What Herds Should Be Check Tested?

It is not always possible to determine by herd history which herds should receive check tests. I have learned from experience and careful study that all purebred herds in the New England States should be check tested with the ophthalmic method before being placed upon the accredited herd register.

Animals in certain grade herds which have repeatedly changed ownership also should receive ophthalmic check tests. We no longer deny that an animal may become completely immunized against the action of subcutaneous tuberculin, due perhaps to the frequent use of small doses and other faulty practices. Many

[1] Presented before the Vermont Veterinary Medical Association, Burlington, Vermont.

of us can readily see how whole herds can become immunized against subcutaneous tuberculin when we reflect for a moment and recall what constituted a tuberculin test but a few years ago—short hour tests and small dosage. And we need not mention the activity of the unscrupulous dealer and his familiarity with the hypodermic syringe. Also I have found certain young animals which apparently possess a natural immunity to subcutaneous tuberculin. Cases have come to my attention where young animals which had never received tuberculin failed absolutely to react to the subcutaneous method, even though large doses were used, and responded violently to the ophthalmic method and on autopsy were found to contain well-marked lesions of disease. These cases and others which have become immunized will respond to the ophthalmic method when properly treated.

RESULTS OF OPHTHALMIC CHECK TESTS

There have been check tested recently in Vermont by the ophthalmic method 50 herds of purebred cattle, representing practically all breeds, and the results have been most astounding. Had the ophthalmic test not been employed there would have remained in these herds 223 diseased cattle, and a number of these herds would have been listed on the free list. Can you conceive of us eradicating tuberculosis unless we look carefully into each case to determine what method of test is required?

These ophthalmic reactors were all slaughtered and showed unmistakable evidence of tuberculosis. Some of the lesions were very slight, some well marked, others extensive and generalized. Some were of a caseous character, while others were caseocalcareous. Acute lesions also are found. In short, all stages of the disease and character of lesions are present on autopsy.

TREATMENT FOR THE OPHTHALMIC TEST

These cases can not be detected by the ophthalmic method unless the animals are properly prepared for treatment, which should be done by instilling ophthalmic tuberculin in one eye about 72 hours before giving the regular test dosage. This preparatory process is known as sensitization. For making the ophthalmic test I would recommend the special disc prepared by the United States Bureau of Animal Industry. There are tablets on the market prepared by the commercial firms which also are satisfactory.

How the Test Should Be Made

It is most convenient for a right-handed man to treat the left eye of an animal, and we have for this reason chosen the left eye for the test, and for uniformity in work it is necessary that a certain system be followed. An attendant should hold the head of the animal, which is not difficult to do and needs no special restraint, while the operator stands in front of the subject and raises the upper lid of the left eye by grasping it gently with the left forefinger and thumb. The tablet, which is held between the right forefinger and thumb, should be pushed up under the external lateral lid into the conjunctive fornix. After a little experience a deft and skillful operator can do this without injury or pain to the animal. When the tablet has been placed in position the fingers of the left hand should be released from the upper lid and brought down over both lids, holding them together firmly yet gently so as not to injure the eye until the tablet has dissolved in the closed conjunctival sac which has been forced by bringing the lids in apposition with each other. Great care must be taken that the tablet is not worked out of the eye before it has had time to dissolve.

The tablet should not be placed into the inner angle of the eye because the proper tissue structure cannot be treated there, also the membrana nictitans, whose function it is to remove foreign bodies, would remove much of the tuberculin before proper treatment has been effected. The tuberculin should be placed into the upper fornix of the lateral angle because that portion of the conconjunctiva is covered with stratified cylindrical epithelium containing goblet cells and tubular glands. These cells and glands are capable of secreting mucin when reacting to the toxins in the tuberculin.

The criterion of a reaction is a mucopurulent exudate in more or less profusion. We can not expect a reaction unless we apply the treatment to tissue capable of reacting. A reaction will usually be preceded by slight redness and lacrimation. A reaction usually does not follow the application of the first tablet, which is employed as the sensitizing agent. The best results follow the application of the second tablet, which should be given about 72 hours later. It is not well to hasten the time of sensitization, because the reaction may in some cases be very slight and tend to cause confusion. The best results may be obtained in from three to five days' sensitization. The ophthalmic test

should never be concluded by the application of only one treatment. Very careful sensitization is absolutely essential if one would expect satisfactory results. If either the sensitization or the subsequent treatment is carelessly or improperly applied one may note a faint mucous discharge at the inner canthus, which may appear as a little wavy thread, and it is difficult to make an accurate diagnosis and differentiate between the mucopurulent exudate of a tuberculous reaction and a slight mucous discharge commonly seen in normal eyes following the introduction of some foreign substance. A man who would make a successful ophthalmic tuberculin test must be a student of the test and very observing of what takes place after treatment has been placed into the eye.

Observation should be made if possible in about 10 hours after the first tablet has been introduced, and a note should be made of any changes observed and any deviation from the normal or control right eye, using the proper characters for future reference. After the introduction of the subsequent treatment, observations should be made at hourly intervals or oftener, beginning not later than three hours after the instillation of the tablet. Some reactions take place within two hours after the second treatment has been applied. If the treatment has been properly applied, the reactions will be clear and well defined, manifesting themselves first by lacrimation, slight redness of conjunctiva, photophobia, and a free discharge of mucopurulent exudate.

If there is a tendency of the reaction being somewhat retarded or ill defined, an additional tablet may be given five hours after the second tablet, and this ofttimes tends to give conclusive results if the animal is tuberculous. If there still remains some doubt as to a positive reaction, the animal may be retested within one week by using two tablets without previously sensitizing. Most eyes remain sensitized a week or longer after the subsequent treatment. Very young animals or calves very frequently will give a reaction to one treatment of ophthalmic tuberculin.

I recommend the tablet form of tuberculin because of the ease with which it can be placed in the proper tissue structures. Only fresh discs which dissolve readily should be employed.

How Tests Should Be Recorded

It is necessary that we adopt the use of some character so that the degree of reaction can be noted as one would note the degree in a thermic reaction. Inasmuch as certain changes take place

in the treated eye during reaction, a note for future reference should be made of these changes. These notes should be in such form that they may be recorded on a chart as one would the numerals in thermic reaction. The notations should be made in the order in which the change becomes manifest. For instance, if lacrimation is observed two hours after treatment, the letter L should be placed in that column. If exudation follows next, then the next column should show LX, and so on. The degree of exudation may be noted from X, meaning slight, to XX, well marked, and XXX, very extensive or copious exudation. When only a trace of exudation is observed, it may be noted by writing ¼ or ½X. A positive reaction may be LX or LXXX of varying degree, depending also upon the character of exudation. Hyperemia or redness may be noted by H.

As the ophthalmic test becomes officially recognized, there will undoubtedly be issued some instructions for adopting a uniform character or code for recording the reactions.

Some Necessary Precautions

1. Don't treat abnormal eyes or a herd when sore eyes are prevalent.
2. Don't try to make an ophthalmic test in a barn or corral where the wind is sweeping through and blowing dust, cinders or other foreign matter.
3. Don't manipulate the eye of the subject unnecessarily and cause irritation from natural results.
4. Don't try to put tablets into the eyes of animals before you pare your finger nails carefully and cleanse the hands.
5. Don't use irritating chemicals on your hands.
6. Don't try to see something in the eye that isn't present.
7. Don't let the owner feel that you have no confidence in your work.

Oklahoma has started a final drive to put the cattle tick completely out of business so far as that State is concerned. * * * That is the spirit of the times. Now let Texas and a few Southern States left fall into line.—*Pacific Homestead.*

The most serious outbreak of rinderpest in 20 years is reported on Masbate Island in the Philippines. Cattle are said to be dying by the thousands.—*Washington Herald.*

RAISING CALVES WITHOUT RAW MILK OR COLOSTRUM [1]

By J. TRAUM

Agricultural Experimental Station, University of California, Berkeley, California

A PRACTICAL and sound method of establishing a tuberculosis-free herd from one containing a large percentage of tuberculin reactors is to provide for the calf, as soon as it is expelled from the womb, an environment free from any infective tuberculous material. One of the important features of this plan is to provide suitable food for the newly-born, which is free from such infective material. To this end it has been recommended to provide milk from animals that are definitely known to be free from tuberculosis, or to feed them upon properly heated milk. The latter plan is adaptable to most dairies and is the most economical.

The question, whether or not calves can be successfully raised without receiving any raw milk during their calfhood, has been frequently asked, and it is a pertinent question in executing the above plan. Unfortunately we have not been able to find in the literature a definite answer to this query. On the other hand, there is sufficient evidence to warrant the statement that, after receiving raw milk for the first few days of their lives, calves can be at least as successfully raised upon heated as upon raw milk. Experiments carried on by Otis[2] at the Kansas Experiment Station bring forth strong evidence to support this statement. For instance:

Experiment	No. of Calves	Days Fed	Av. Gain per head	Daily Gain per head
Skim milk, heated to 212° F	10	154	233	1.51
Whole milk	10	154	287	1.86
Running with dams	22	140	248	1.77

The 42 calves were then placed in feed lot and fed for seven months—they were then about one year old.

Experiment	No. of Calves	Months Fed	Av. Gain per head	Daily Gain per head
Skim milk, sterilized	10	7	440	2.10
Whole milk	10	7	405	1.93
Running with dams	22	7	422	2.00

[1] Presented at the California State Veterinary Medical Association Meeting, Fresno, Calif., June 6, 1921.

[2] Bulletin 126.

It will be seen that the heated skim milk calves made the best gains. The feed records show that these calves produced 100 pounds of gain for 439 pounds of grain, while the whole milk calves required 470 pounds of grain per 100 pounds of gain, and the calves running with the dams required 475 pounds of grain per 100 pounds of gain. Unfortunately, it was not possible, from these experiments, to determine the age of the calves at the beginning of the experiment.

On this point, Dr. Williams, in his recently published book, "Diseases of the Genital Organs," states: "I consider it highly important that the milk fed to dairy calves, after they are about ten days old, be boiled. It is virtually always mixed milk coming from a large number of cows. Often when there is a bad udder or a cow has aborted or had retained afterbirth, the milk is fed to calves. Such milk is often badly contaminated with infectious discharges from the uterus which have flowed down the tail and thighs. It is safe when boiled, but otherwise unsafe. The same is generally true of mixed raw milk. It contains all infections reaching the milk of any cow, so that the danger is multiplied by the number of cows contributing to the ration of milk fed."

Williams' principal argument against feeding heated milk in first ten days of calves' lives is that he considers it necessary to supply the calf with protective substances present in the raw milk of its dam against infection with organisms transmitted by the dam. Quoting Williams verbatim on this point, he states: "Experimentally, I have fed numerous calves upon thoroughly boiled milk. A considerable portion of these, probably one-third, lived and grew splendidly; the others quickly perished from dysentery, arthritis or pyemia. Those which did well showed health and vigor beyond that of calves fed upon raw milk. A further study reveals the interesting fact that the calves which did well upon cooked milk came from clean herds where harmful genital infections were low or not clinically recognizable, while the calves which promptly sickened and died came from herds where genital infections were intense. In other words, the cooked milk was excellent for those calves which were born comparatively free from bacteria in the meconium, and highly perilous for those having large volumes of bacteria in the alimentary tract when born. The cooked milk was perfect as a food, but useless as a bactericide."

Williams further reiterates that point by advising the use of anti-scour serums whenever it becomes necessary to feed boiled milk. He states: "While a calf can be well grown experimentally upon boiled milk from the outset, it requires very close watching and skillful handling in most instances. I prefer that, for the first eight or ten days, the calf should be fed the very small ration of raw milk from its dam. During this period there is confessedly the danger from infection borne in her milk, but under usual conditions this is more than counterbalanced by its content of protective substances of a highly essential character. The plan has very important limitations. If the dam is tubercular, her raw milk should not be fed to her calf. Either the milk of a tubercle-free cow should be substituted or the milk of the dam boiled, fed very sparingly, and the loss of the antibodies in her milk destroyed by boiling, counterbalanced by the liberal use of calf scours serum."

He continues: "My results were in such sharp contrast with the observations of others that their reliability was questioned. Some disbelieved the effectual and reliable boiling of the milk. In order to meet this objection, I personally removed two calves from their dams at birth, without the dam's having so much as licked her young. These were placed upon milk autoclaved for 30 minutes under 15 pounds of steam, equivalent to a temperature of about 240 degrees F., or 28 degrees above boiling. The milk was browned to about the color of weak coffee. I believe that, if vitamins or other essential constituents were destroyed by heat, this would demonstrate the fact. But the calves did phenomenally well, equalling in health and rapidity of growth any I have ever observed. One calf was extremely thin, weak and sick at birth. She weighed forty-nine pounds. Each calf gained upon an average of two per cent of its body weight at birth per day during the experiment. Neither calf at any time lost the lustre of its hair. After the first few days, they remained plump and were unusually playful." Dysentery and threatened pneumonia were controlled by the liberal use of serum.

The question of the destruction of vitamins by heating milk has been mentioned above. Reports of results of experiments concerning these important substances have been, and are being, issued so rapidly that it is difficult to keep right up to the minute on the latest printed information especially for one who is not experimenting nor directly concerned in studying or teach-

ing the subject of nutrition or biochemistry. We, therefore, cannot be too sure of any stand on the present status of vitamins. The question of the effect of heating and drying upon the vitamins is receiving a great deal of attention. Daniels and Laughlin, in Journal of Biochemistry, vol. 44, No. 2, November, 1920, draw conclusions that have direct bearing on the question of the use of heated milk for bringing up the young. It is there pointed out that the deficiencies in heat-treated milks are due to precipitation of insoluble calcium salts. These deficiencies, however, can, no doubt, be avoided by rapid heating and proper stirring of all the heated milk before feeding. These workers state:

"The results of all our experiments on the long heat-treated milks point to the same conclusion, namely, that, in the process of heating, the calcium salts are rendered more or less insoluble, depending upon the length of time the milk is heated. In this insoluble form they may be lost, owing to the fact that some of the precipitated material adheres to the container, as in the case of long pasteurized or slowly heated milk, while some, for example, in evaporated milk, separates out on standing. When especial care was taken to include the insoluble material by colloidal suspension (as in condensed milk), results comparable to those on raw and quickly boiled milk were obtained. *We have secured no data indicating that either the fat soluble or the water soluble vitamine in milk* is affected by heat treatment. Nor is the casein apparently affected. Rats fed superheated milk supplemented with calcium phosphate properly incorporated made normal growth gains."

More recently (Science, n. s., vol. 53, May 6, 1921, p. 446) the Minnesota Experiment Station workers have found that destruction of the nutritive and antiscorbutic properties of milk is caused by oxidation rather than by heating, and their work permits them to state: "Milk may be pasteurized in closed vessels or boiled in the open air without appearing to lose its nutritive and antiscorbutic properties when fed to guinea pigs." Oxidation would appear to be a more important factor than heating as far as the nutritive and antiscorbutic properties of milk are concerned.

Another difficulty in carrying out the plan outlined in the introductory paragraph for the establishment of a free herd from a badly-infected one, is the question of colostrum. Practically every book and publication which treats of the subject of raising

calves insists that the feeding of colostrum to the newly-born is absolutely essential. Williams emphatically disagrees with these teachings. He states: "Notwithstanding the assertions of numerous teachers regarding feeding, the necessity for feeding colostrum to a calf is a myth."

In the May, 1921, issue of the North American Veterinarian, Panisset throws new light on the physiological significance of colostrum. He points out that work carried out by Porcher and himself indicates that colostrum is a product of retention. With the inception of gestation, the udder is secreting, not actively but in quantities sufficient for these secretions to be emptied into the lactiferous canals and, not being eliminated, they are resorbed, leaving large numbers of leucocytes, charged with fat globules, which are found in the colostrum. To prevent retention, they milked all four quarters of a subject daily, beginning 58 days before parturition. For the first four or five days they obtained a fluid colostrum, 48 days prior to parturition. The colostrum had the appearance of milk and the milked product was positively milk one month before parturition. Large quantities of milk, however, did not come until glandular activity was incited by parturition. Colostrum and milk are originally the same product; one is retained and the other is excreted.

I could find nothing more in literature that would further aid us materially in determining the efficiency of raising calves where the milk portion of their diet never contained the raw product. The presentation of observations bearing on this point, covering a period of over 4 years, though meager, is, therefore, thought highly desirable.

In the fall of 1916 a considerable number of the cows recently purchased for a dairy producing Grade A raw milk, reacted to the tuberculin test and, at that time, it was considered inadvisable to either slaughter or sell these cows, so a tuberculin-reacting herd was started. Provision for the proper protection for the calves born upon the infected ranch was imperative, and, with this in mind, a procedure was adopted by Mr. L. J. Kelley, the manager, which, in brief, is as follows:

(1) Cows in the reacting herd, when about to freshen, were put in box stalls.

(2) Calves, before being licked by cow, were removed as soon as dropped, and rubbed dry.

(3) It was intended to douche the bowels of the new-born calf

with warm salt solution in lieu of colostrum feed, but in the non-reacting herd there were usually about 25 fresh cows yielding sufficient colostrum to frequently supply the calves born in reacting herd, and the plan of douching the calves was not religiously adhered to, especially when labor was high. In fact, douching was finally done only when no colostrum was readily available.

(4) The whole and skim milk fed to calves in pens which came from the reacting cows was heated to at least 145° F. and held for at least 30 minutes. At the end of four or five months, the calves were sent to the range and later bred.

The work was not started with a view of reporting upon it, and it is fully realized that it lacks a great many features of a well-planned experiment. Nevertheless, it has a practical value and should help us in making progress in the control of tuberculosis, at least until such time as a well-planned experiment or other experiences indicate different lines of procedure.

The dairy in question is a strict business proposition and is expected to take care of the wear and tear and to yield a fair income on the invested capital, and any work done is of necessity carried on in the most practical and economical manner. This dairy consists of 214 milking cows, mostly Holsteins, with the usual number of dry cows (about 65), heifers 85, and calves not yet bred 175. As pointed out, some of the original recommendations were not adhered to; nevertheless, there were at least 50 calves raised that had no raw milk product in their diet during their existence, and practical dairymen and expert dairy husbandmen, who have seen the calves and heifers at various ages, have gained the impression that these animals are as well-developed for their respective ages and breeds, as can be found in the average well-kept grade herd. Those animals that have matured and calved one or more times have fine average producing records. In brief, nothing has thus far come to light in our experience that would indicate that calves receiving no colostrum nor unheated milk are inferior animals, either in their calfhood or later, to a similar grade of animals raised on unheated milk.

In conclusion, I desire to direct attention to the following:

(1) That we have been unable so far to find any information which can be construed as determining definitely that calves cannot be raised without the use of colostrum or raw milk;

(2) That we have presented experiments, experiences and

opinions, which, though not extensive and conclusive, nevertheless indicate that such can be successfully done;

(3) That when it becomes necessary to feed heated milk to calves, there should be no hesitancy in prescribing that such milk, whether skim or whole, be heated above the pasteurization requirements for human consumption. Milk heated to the boiling point, in the experience of Williams, Otis and others, is not inferior as a good food for growing calves to ordinarily pasteurized milk.

In an editorial entitled "State Farms for Tuberculous Animals," the St. Paul *Farmer* says: "It has been suggested there might be evolved some plan whereby both the owners of pure-bred stock and the Federal and State Governments could save money in tuberculosis-eradication work by establishing State farms where tuberculous animals could be kept until some salvage could be secured. A considerable number of breeders in years past have attempted to maintain separate quarantine herds under the Bang plan, separate and apart from their main herds; but few individual farmers are so situated that they can maintain an absolute quarantine. The deadly infectiousness of the disease has nearly always caused breeders working under the Bang plan considerable loss in the long run. However, it is argued that the State might maintain special farms where tuberculous animals could be kept until such time as the calves from reacting females are dropped. These calves, which are free from tuberculosis at the time of birth, would then be immediately taken to clean herds, where a large percentage of them would grow up free of disease. The saving of these calves would mean a tremendous saving, both in money and in good blood to the live-stock industry. It is a strange fact, but almost literally true, that tuberculosis and other infectious diseases always seem to take the most valuable animals in the herd."

Dr. C. P. Fitch, of the University of Minnesota, was a recent visitor to Washington, D. C., where, as chairman of the A. V. M. A. Committee on Abortion, he met the Committee on Medical Sciences of the National Research Council for the purpose of securing aid and cooperation. Accompanying him were Drs. E. C. Schroeder, J. P. Turner, Gilbert Creech and several others.

CLINICAL AND CASE REPORTS

(Practitioners and others are invited to contribute to this department reports of unusual and interesting cases which may be helpful to others in the profession.)

A CASE OF PURPURA HEMORRHAGICA WITH SPECIAL REFERENCE TO THE USE OF EPINEPHRIN [1]

By SIMON D. BRIMHALL and JOHN G. HARDENBERGH.

Division of Experimental Surgery and Pathology, The Mayo Foundation, Rochester, Minn.

PURPURA HEMORRHAGICA of horses is comparatively rare and professional interest in its occurrence probably is derived more from its unusual features than from consideration of its economic importance. However, in purpura hemorrhagica, the veterinarian has a rather unsatisfactory case to treat because the prognosis is so uncertain and, even with recovery, the owner usually loses considerable on account of the long period of treatment and the rest necessary before the affected animal can work again. The case reported here was severe, but it resulted in a fairly rapid and very satisfactory recovery.

REPORT OF A CASE

A five-year-old grey mare, weighing about 1,250, was found on the morning of May 4, 1921, with a marked swelling of the left nostril, almost occluding the air passage and involving the upper lip, particularly the anterior portions. There were also three sharply defined swellings on the abdomen, and the hind legs were badly swollen. The upper lip showed an extensive submucous hemorrhage. Serous fluid dripped steadily from the mucosa of the nose and lip. All the swellings were sensitive and pitted on pressure.

A diagnosis of purpura hemorrhagica was made. The possibility of malignant edema was excluded by immediate laboratory examination of material from the affected areas. Later, during the course of the disease, bacteriologic examinations were made of the blood and serous exudates in order to determine the presence or absence of infecting organisms. These materials did not

[1] Presented before the Minnesota State Veterinary Medical Association, Hutchinson, July, 1921.

produce a growth on various culture mediums and failed to produce any untoward effects when injected into guinea pigs and rabbits. Consequently, no light was shed on the question of microbial infection so far as the methods used are concerned.

The prognosis was not favorable because the condition had proceeded at a rather alarming rate since it was first observed. Since the case was apparently one of blood-vessel wall involvement primarily without evidence of any infection other than an elevated temperature, the use of epinephrin was decided on.

Treatment was begun at 2:00 p. m. on the first day, at which time the mare's temperature was 104.8, pulse 76 and weak, respirations rapid and labored. Two cubic centimeters of epinephrin (adrenalin) solution (1:1000) were given intravenously and one pound of Epsom salts administered by mouth. Several puncture incisions were made through the mucous membrane of the swollen upper lip to promote drainage of the extravasated serum, with the hope of relieving some of the nasal swelling and rendering tracheotomy unnecessary.

Within five minutes after the injection of the epinephrin, the mare was sweating lightly over the entire body; this continued for about ten minutes. Thirty minutes later she started pawing and showed rather characteristic symptoms of colic.

At 3:30 p. m. the temperature was 103.8; the pulse was fuller, slower and stronger. Symptoms of colic were still present.

At 7:30 p. m. the temperature was 102.8; the pulse was 60 and fairly strong. Respiration was labored; the mare was still very uneasy. Two cubic centimeters of epinephrin solution were given intravenously and one-half pound of Epsom salts by mouth. Generalized sweating again appeared for a few minutes.

May 5, the mare was much brighter, and able to drink water and eat hay and grain. The temperature was 100.2; the pulse was 56; the heart action was good; the swellings around the nostrils had not increased, and respiration seemed much less labored. The swellings on the abdomen had enlarged somewhat and coaleseed; the swellings on the leg were unchanged. Two cubic centimeters of epinephrin solution were injected intravenously; light sweating was noticeable for a few minutes.

May 6, the mare was turned out to graze; the temperature was 101.6; the pulse was 60; there was no dyspnea, as the nasal swellings were greatly reduced. The swellings on the abdomen were somewhat larger. The hemorrhagic area beneath the mucous

membrane of the upper lip was entirely resolved. No epinephrin solution was administered.

May 7, the mare was reported to be improving but she grew worse before noon and when seen later, a hard, tender swelling had developed in the outer wall of the right nostril, occluding the air passage on that side and giving rise to marked dyspnea. The upper lip was again badly swollen, also the pendulous portion of the lower lip; the swellings on the abdomen were considerably larger. The temperature was 102.2; the pulse was slow and weak. Two cubic centimeters of epinephrin solution were injected intravenously and multiple injections of 0.5 c.c. were made around the margins of the nasal and abdominal swellings. One pound of Epsom salts was given by mouth and puncture incisions were made through the mucous membranes of the upper and lower lips. Generalized sweating was observed within ten minutes after the epinephrin injection; it persisted for about the same length of time.

At 9:00 p. m., the mare was plainly much worse; the temperature was 104.6; the pulse was weak and rapid; the respiration was dyspneic, due to increased swelling around the nostrils. However, it was decided to postpone tracheotomy as long as possible. Two cubic centimeters of epinephrin solution were given intravenously, and generalized sweating occurred within five minutes.

May 8, the mare was greatly improved and could eat and drink. The nasal swellings were reduced; the temperature was 101.4; the pulse was fairly strong, and the respiration was normal. Two cubic centimeters of epinephrin solution intravenously again induced light generalized sweating. The animal was turned out to graze; she exhibited marked stiffness of the hind legs. A tonic of iron, quinin and strychnin was prescribed for administration three times daily.

May 9, the mare showed continued improvement. Subcutaneous injections of 1 c.c. of epinephrin solution were continued three times daily for several days. Three weeks later the animal had completely recovered and was doing light work. When last seen she was ready for hard work. That the swellings did not break down and slough was no doubt an aid in the rapid recovery.

DISCUSSION

It is regretted that only one case has been observed. The results, in this case, which was really serious at the outset, seem to

justify more frequent use of epinephrin in purpura hemorrhagica. Because of the rarity of the disease it seems inadvisable to wait for further cases from which to draw definite conclusions.

Although the use of epinephrin in this condition appears therapeutically sound, and has been recommended by a few writers, few reports of the results obtained are available in veterinary journals; however, several physicians have reported favorably on its use in cases of purpura in man. Since purpura hemorrhagica in its clinical and pathologic aspects is essentially an affection of the blood vessels, a brief consideration of the physiologic action of epinephrin on those structures may be of value.

Meyer and Gottlieb[1] state that the most efficient means for the rapid restoration of the circulation in all conditions of vascular depression is the intravenous injection of epinephrin. It constricts the arterial path by acting locally on the vessel walls and restores the tone of the splanchnic vessels even after they have been relaxed completely. A change in the distribution of the blood is produced; while this action is usually fleeting, its good effects appear to last for a long time when it is used in cases of circulatory disturbance. Recent experiments have shown that the vaso-contrictor action also prevents inflammatory transudation and that either intravenous or subcutaneous injections of the drug cause an increase in the coagulability of the blood, both of which actions seem to be highly desirable in the disease under discussion.

The fact that, after the effects of the epinephrin have subsided, vasodilation may occur to an even greater extent than was originally present is a possible objection that may arise. It is believed that such action is not greatly to be feared; it was not evident in the case here reported. To guard against such an after-effect, it might be well gradually to "taper off" the dosage of the drug prior to discontinuing it.

The phenomenon of light generalized sweating after each intravenous injection of epinephrin, as noted in this case, is not understood in view of the general knowledge that this drug is supposed to have no effect on the sweat glands, although it acts specifically on the sympathetic system.

No good can result from giving an excessive amount of the drug at one time and it may even be dangerous by causing too

[1] Meyer, H. H., and Gottlieb, R.: Pharmacology; clinical and experimental. Philadelphia, Lippincott, 1914, 616 pp.

pronounced increase of blood pressure. Two cubic centimeters of 1:1000 solution is about the proper dose for the horse. We believe that this amount should be given intravenously at least twice daily at the beginning of the disease together with multiple subcutaneous injections of small amounts around the margins of the swellings. After a few days, if there is improvement, subcutaneous injections of 1 c.c. three times daily may be substituted for the intravenous and local injections and then gradually discontinued. The practitioner will recognize that with this treatment the affected animals should be given a light laxative diet. The appetite should be maintained, if possible, and the bowels kept freely open.

CHLOROMA IN A COW [1]

By C. H. WEAVER

Pathological Division, Health of Animals Branch, Ottawa, Canada

THE RARITY of chloroma seems to warrant the recording of individual cases. The one herein described was found in the Federal Meat Inspection Service at the Toronto District in April, 1920.

The subject was a well developed and well nourished cow, with a dressed weight of 520 pounds. It had passed a physical antemortem examination as healthy. During the course of dressing, while the hide was being removed, an enlargement was found and removed from the left abdominal ribs. This, at the time, was taken to be an abscess, but it was noticed to be of a green color. Later, when the carcass was eviscerated, lesions were found as follows: Posterior mediastinal and left precrural lymph glands greatly enlarged, green in color, soft in consistency, and with softened degenerated areas. Lungs contained several large areas and numerous small foci which corresponded to the lymph gland lesions. The smaller ones, however, were free of degeneration process. The liver contained several small lesions similar to those in the lung, and the organ was greatly enlarged, weighing 20 pounds. The portal glands showed enlargement only. Both kidneys contained well marked

[1] Published by permission of F. Torrance, Veterinary Director General.

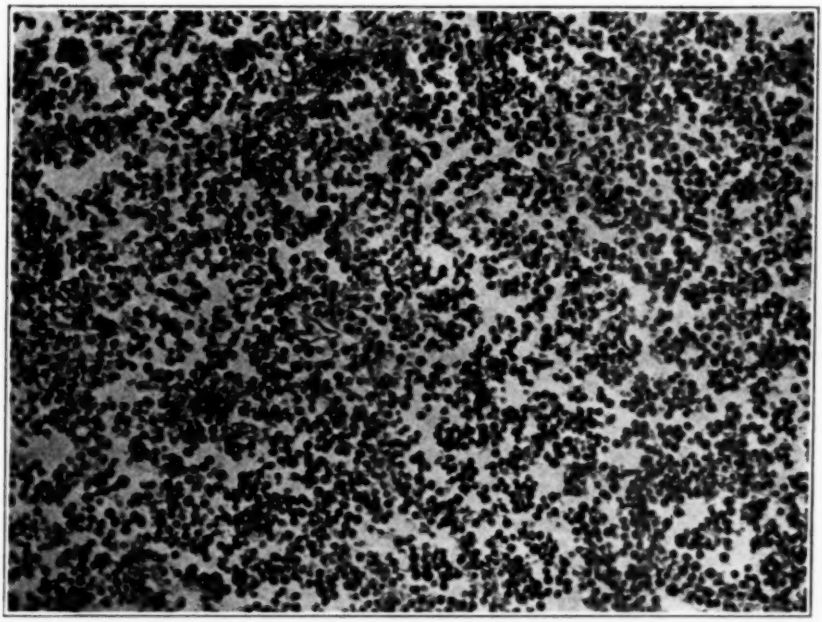

Fig. 1.—Section of tumor, low power, showing cellular arrangement and the small amount of stroma which characterized all lesions. Stained with phosphotungstic-acid hematoxylin.

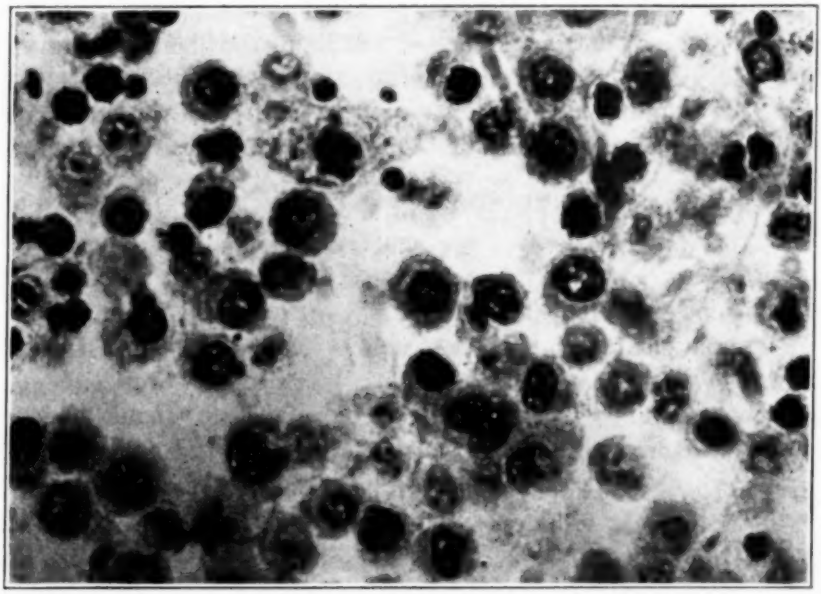

Fig. 2.—The same in higher magnification, showing the large non-granular cells. The smaller cells with eosinophile granules have photographed with equal density throughout nuclei and cytoplasm. Stained with Mallory's eosin and methylene blue.

petechiæ, but were approximately normal in size and the capsule stripped readily. The spleen and abdominal viscera other than mentioned were normal, except for a general hypertrophy of the lymph glands. The one oustanding feature of all the lesions was the bright green color which they possessed. This color, however, soon faded when exposed to the air.

At the autopsy the first lesion found, on the side of the animal, was taken to be a wound infected by chromogenic organisms, from which the other lesions had developed. This view was supported by the condition of the lymphatic system and the petechiæ in the kidneys. A diagnosis of sepsis was therefore made.

LABORATORY EXAMINATION

Through the kindness of Dr. Robinson, Pathologist to the Toronto General Hospital, the material was worked over in his laboratory. Cultures were made on ordinary laboratory media which were negative for *Bacillus pyocyaneus* or similar organisms. Rabbit inoculation was made for *B. necrophorus* which also was negative. Tissue was fixed in 10 per cent formalin, some of which was later refixed in Zenker's fixative, from both of which paraffin sections were made. Frozen sections from the formalin-fixed tissue were subjected to oxidase reaction using benzidine, with the characteristic reaction for marrow type of cells. Moreover when portions of the lesions, which had almost completely lost the green coloring, were placed in hydrogen peroxide the original bright green color returned. Unfortunately blood smears were not made, nor was the marrow examined.

MICROSCOPICAL FINDINGS

All the lesions presented the same cellular characteristics. The growths were extremely poor in stroma with very delicate thin walled blood vessels. The tumors invaded the surrounding tissue without definite capsule formation. There were two types of cells, one a large rounded cell with large nucleus, usually eccentrically situated, rich in chromatin, prominent nucleolus and with pale non-granular cytoplasm (myeloblasts). The other type was small with densely staining nucleus, rounded or occasionally lobulated. The cytoplasm contained large granules which took the eosin stain deeply (eosinophile myelocytes).

Kidney—There was well marked venous engorgement with cortical hemorrhages. Tubular nephrosis was quite marked but no tumor lesions could be found in this organ.

POSTMORTEM REPORT ON TUBERCULIN REACTING CATTLE

By L. ENOS DAY, *Chicago, Illinois*

IN ORDER to give a better understanding of the sequence of conditions which have a bearing, either directly or indirectly, upon the findings of the postmortem examination of the animals in question, or the lesions found, it seems best to take up the various points in the order in which they were presented.

About the first of April of this year I received instructions from the Chief of the Bureau of Animal Industry to proceed to Ogden, Utah, for the purpose of assisting in holding postmortems on certain cattle which had reacted to the tuberculin test in Star Valley, Wyoming, and were to be slaughtered at the Ogden Packing and Provision Company's plant in Ogden as soon as convenient to ship the cattle to that point. I was further instructed to visit Star Valley for the purpose of making an investigation of the conditions which existed there.

During the early part of this year Dr. J. T. Dallas, in charge of tuberculosis eradication in Wyoming, and Dr. G. H. Good, Assistant State Veterinarian of that State, went to Star Valley for the purpose of making the initial test on all of the cattle in Star Valley over six months of age, with a view to ultimately eradicating tuberculosis from the cattle in that vicinity. Before this work was begun there was an understanding among all parties concerned that all of the reactors were to be slaughtered and the owners reimbursed. The initial test was completed during the early part of April.

About this time Dr. Dallas notified me that arrangements were being made to ship about 85 head of the reactors to Ogden for slaughter and that the cattle would arrive there about April 18. I arrived in Ogden on the day appointed, and at once met Dr. Dallas and Dr. Good, also Dr. B. F. Davis, State Veterinarian of Wyoming, and Dr. E. D. Kennedy, inspector in charge at Ogden, and his assistant, Dr. J. F. Hauber. Arrangements were made for slaughtering the cattle on the following day, at which time Dr. F. E. Murray, in charge of tuberculosis eradication in the State of Utah, and his force were expected to be present.

On the following day, when the process of slaughtering began, our forces were organized in such a way that each had a particular part only to examine. By so doing a more thorough exami-

nation could be made, and at the same time the inspection would not hinder the progress of slaughter.

I was informed that previous to this lot of 85 reactors 45 head of reactors from Star Valley had been slaughtered at the Ogden plant and that lesions were found in 23, the remaining 22 showing no lesions. Of the 23 in which lesions were found, 17 showed lesions in the skin. These results were communicated to each one present with a view to stimulating a more careful search for lesions in the present lot.

The results of the postmortem findings were as follows:

Skin lesions only	29
Skin lesions combined with other lesions	9
Udder lesions, either alone or combined with others	10
Teat lesions combined with other lesions	4
Teat lesions alone	5
Total number condemned	3
Total number showing lesions	62
Per cent found showing lesions	.73
Per cent found showing no lesions	.27

There was a thickening of the subcutaneous tissue in one case involving very slightly the deep layer of the skin over the tuberosity of the ischium. The thickened area was about 2 inches wide and about 3 inches long and ½ inch thick, pinkish gray in color and quite firm. At the time we doubted whether this change in the subcutaneous tissue was tuberculous. However, portions were sent to the laboratory at Chicago, and it was later found to be tuberculous ,which raised the percentage of tuberculosis lesions found from 71.77 to 73. If we consider the teat lesions as skin lesions, which they practically were, we have 47 of the 85 showing lesions in the skin, or 55.3 per cent.

The large number of skin lesions attracted attention and comment by those present. In all cases the lesions in the skin were located in the deep layer of the true skin and in the fascia beneath. In no place did the tuberculous area extend through the skin and to the outer surface. All appeared to be chronic. In most cases they were caseous or caseo-calcareous. The lesions varied some in size and number; in some instances there were only three or four spherical nodules from 3 to 5 mm. in diameter, while in others the nodules ranged from 2 mm. to 5 cm., or even more. In most cases the nodules were located on the hind quarters along the outer and back part of the thigh or below the hock, although some were found on the forelegs and under the

belly and flank. In all cases they were found in the locations where the skin came in direct contact with manure. All of the lesions were very characteristic of tuberculosis with the exception of the one before mentioned.

There were 68 owners with herds ranging from 10 to 133 cattle, who contributed to the lot of 85 reactors, the number of reactors ranging from 1 to 4. In 51 of the herds only one reactor was found in each herd. Of these 51 reactors 22 showed skin lesions only, and 3 showed teat lesions only.

It will be remembered that only 3 of the 85 reactors were condemned. Only 2 of these were open cases and could have been classed as "spreaders." This lack of open cases was surprising to us, since such a large number of skin lesions only were found. The thought was advanced that there must have been a number of very advanced cases which failed to react to the test remaining on the farms. While we recognize the fact that occasionally a tuberculous animal does not react to the test, we have no records where more than 43 per cent of such animals on one occasion failed to react, as would be the case in the 51 herds each of which contained only one reactor, and of this number 22 showed skin lesions only. With these facts before us it seems apparent that we must look for some more patent cause for these conditions. I believe the following to have a direct bearing on this question and that it offers an explanation for many of these lightly infected cases.

Star Valley, Wyoming, is located along the western border of the State. The Valley is about 50 miles long from north to south, and from one to six or eight miles wide. It is paralleled on the east and west sides by a rather high mountain range. Melted snow from these ranges serves to supply moisture for the growing crops through a well-planned system of irrigation. Dairying and farming are the only industries. The principal crop is alfalfa, although some timothy, wheat and oats are raised. The high elevation makes the season between frosts too short for corn. Practically all of the crops are fed on the farms, the most of which are small. Dairying is the chief industry. There are four cheese factories located at vantage points in the Valley. All of the milk is manufactured into cheese. Montpelier, Idaho, a distance of 45 miles, is the nearest railroad point, which is reached by team over a mountain pass more than 9,000 feet high, and a very poor road during the winter and spring months.

During the early part of the summer of 1919 the snow on the mountains melted earlier than usual and water became very low in the irrigation ditches. There was practically no grass on the ranges in July. Severely cold weather started in October, and the winter of that year proved to be the severest in the past 30 years. Many of the young cattle and dry cows were sent out of the valley to other parts where feed was more plentiful and most of them did not return. Hay fed those that remained was hauled from Montpelier, Idaho, at a cost, delivered, of about $90 a ton. Owing to the great shortage of feed and the high prices of hay, and the severe winter, it is estimated that between 30 and 50 per cent of the cattle which remained in the Valley died.

Upon investigation, the condition in which cattle are kept in this locality was found to be very bad, and insanitary in the extreme. The barns and corrals in which they are confined and sheltered during winter are very filthy. Many of the stables are built of small pine logs. Cow manure is used instead of mortar to chink the cracks. No bedding or litter of any kind is used in the barns, stables or corrals, and the cattle stand or lie in feces from a few inches to 2 feet deep, which is undiluted with straw or other litter. The manure is allowed to remain in the barnyards from year to year in most places, and even in the stables in some. Manure is piled high around many of the stables, obstructing the drainage, and as a result water from the outside seeps in to be added to that excreted by the animals themselves.

It seems reasonable to suppose that under the conditions just mentioned all or nearly all of the advanced cases of tuberculosis succumbed during the severe winter and spring of 1919-20, which animals were in all probability responsible for spreading the infection, and that those that contained skin or teat lesions only became infected at that time. The filthy practice in the care of the animals already mentioned would explain the large number of skin lesions, which would be caused by manure collecting in large quantities in the hair and on the skin, causing irritation of the skin and cracking, causing an atrium of infection.

Aside from the skin and teat lesions referred to, there were three other cases which deserve mention. One was a 2-year-old heifer, not pregnant, which was the only reactor in a herd of 23. This animal showed skin and teat lesions only. There was one nodule at the base of one of the teats not over 2 mm. in diameter, and four or five nodules just under the skin on the

back part of the hock, the largest of which was about 5 mm. in diameter. In the other two, each had a tuberculous nodule about the size and shape of a shelled almond, located along the fascia of the flexor carpi medius, about 2½ inches above the carpus. The udders of both of these animals contained some tuberculous nodules. The skin of one was also tuberculous.

There were in all 6,669 cattle tested in the Valley, of which 133 reacted, the autopsies of 85 of which I had the good fortune to view. The intradermal test was used on all tested. There was one cow which failed to react to the test, although a diagnosis had been made by physical diagnosis. This animal was slaughtered on the farm where owned, and on postmortem was found to be a generalized case.

In places I noticed that the chickens roosted in the stables where the cattle and horses were kept. During the time I was in Star Valley I saw a postmortem held on a chicken affected with tuberculosis, and was informed that a large number of chickens were affected with the disease in that locality. I am mentioning these facts to emphasize the careless way in which domestic animals and fowls are cared for.

It has been pointed out that avian tuberculosis has been found in the skin of swine, and it might be possible that this type may affect cattle under certain conditions. I was not able to connect avian tuberculosis in this instance with the skin lesions found in cattle.

Dr. S. B. Nelson, who for twenty-five years has been dean of the Veterinary Department of Washington State College, is now giving his entire time to his duties as director of Agricultural Extension, and the deanship has been conferred upon Dr. E. S. Wegner, acting dean for the past two years, and Professor of Veterinary Surgery. Dr. Nelson was intimately associated with the affairs in veterinary medicine in the entire Northwest for many years, and the veterinary profession and the livestock industry regret his withdrawal from this phase of the livestock work, but he will be heartily welcomed in his new position.

The Brazilian Federal Minister of Agriculture announces that rinderpest is extinct in the State of Sao Paulo. It is stated that no new cases have occurred in Brazil during the last sixty days.

ABSTRACTS

LEAD POISONING IN HORSES. V. Kirschner. Zeitschrift für Veterinärkunde, vol. 30, pp. 495-497.

The author refers to lead poisoning in 34 horses, 14 of which died. Three of the horses were slaughtered for food and passed. The cause of the poisoning was the use of lead-containing tanbark obtained from a white lead factory, as bedding in the stalls. A sand-like mass found in the larynx of a dead horse contained lead. Treatment consisted of alkalies, caffein and camphor.

Symptoms—Normal temperature in most cases; in fatal cases up to 40.3 C. (104° F.). Respiration, shallow, 16 to 30. Pulse, 40 to 46, but 80 to 100 in severe cases. Nasal discharge was slight or heavy, unilateral or bilateral; may last for several weeks, frequently mixed with food particles. In a few cases there was swelling of the eyelids. Conjunctiva and nasal membranes in all cases were pale yellow to yellow red; dark red in severe cases.

Salivation was present in three-fourths of the cases. Frequent swelling, with pain and heat, was noted in the region of the larynx. Percussion and auscultation in light cases gave no results. Bad smelling breath, but no diarrhea was noted. Stricture of anus was frequent in the beginning of the poisoning.

Course—In one case, sudden death occurred without previous symptoms. In most cases patients become dull, hang their heads and sometimes sway in their hindquarters. Appetite is good in the light cases. Half of the patients recovered in two to three weeks; in the others there were emaciation, staring coat, and death after severe lung and heart disturbances.

Autopsy—In all cases the lungs were profoundly altered; almost always lung gangrene, with fatty degeneration of the heart. There was cloudy swelling of liver in half of the cases. In most cases, slight hemorrhagic inflammatory areas were observed in various sections of the small intestine, cecum and colon.

W. N. BERG.

BITE WOUNDS CAUSED BY RABID AND SUSPECT RABID ANIMALS AND THE RESULTS OF VACCINATION. Zeitschr f. Fleish u. Milchhygiene, vol. 31, (1921), No. 8, p. 107.

In the year 1917 in Germany there were reported officially 282 cases of wounds caused by rabid or rabies suspect animals. Of

these 150 were given Pasteur treatment in the Robert Koch Institute in Berlin, 113 in the Pasteur Department of the Institute of Hygiene of the University in Breslau, and 19 persons received no treatment. Of those treated 0.38% died of rabies, of those untreated 21.1% died.

In 1918 there were reported in Prussia 194 cases of wounds caused by rabid and rabies suspect animals. Of these 189 were given the Pasteur treatment: 121 in the Robert Koch Institute in Berlin, and 68 in the Pasteur Department of the Hygienic Institute in Breslau. Of the vaccinated persons 1.58% died of rabies. Of the non-vaccinated 25% died. The percentage of fatal cases among those vaccinated appears relatively high. This mark has not been reached since 1909 (2.13% fatal cases). In this connection, however, it must be stated that one patient received the first treatment ten weeks after being bitten and succumbed to rabies. The delayed application of the vaccination in this case explains the relatively unfavorable results.

L. T. GILTNER.

A STUDY ON THE ANTI-RABIC INOCULATION OF DOGS AND THE RESULTS OF ITS PRACTICAL APPLICATION. S. Umeno and Y. Doi. Kitasato Arch. Exper. Med., vol. 4 (1921), No. 2, p. 89.

In Japan rabies has existed since 1901 and in later years has been spreading quite rapidly. In 1915 there were 1,424 rabid dogs, and in the same year 3,230 persons were bitten. In 1918 in the Kanagawa Prefecture alone there were 213 rabid dogs and 218 persons bitten; in the same year in the Tokyo Prefecture there were 511 rabid dogs and 682 persons bitten. The methods already applied in the prevention of the disease, viz., killing of rabid dogs and all non-pet dogs, and the confinement of pet dogs, or the use of muzzles have not proved effective. The authors believed that prophylactic vaccination might secure the desired results. For anti-rabic vaccine they used the brain and cord of fixed-virus rabbits. This material was ground up in a mortar and mixed with four-fifths parts of phenolized glycerin water (60 parts glycerin and 40 parts water containing 1.25% phenol). The vaccine was then stored at room temperature 18°-22° C. for two weeks or in the ice box for 30 days, when it was ready for use. The dose was 6 c.c. of vaccine per 15 kg. bodyweight. This quantity of vaccine was injected subcutaneously at two different sites.

The vaccine was used experimentally on 500 dogs with no losses, and no cases of rabies development during the time of observation.

In Kanagawa Prefecture in 1918 6,644 out of 9,402 dogs were vaccinated, and in 1919 9,150 out of 14,644 registered pet dogs were treated. No vaccination losses occurred, and no cases of rabies developed in these dogs after vaccination. In 1919 the total number of rabid dogs decreased to four-fifths of that of the preceding year, while the number of persons bitten during the same year decreased to three-fourths of that of the preceding year. All the cases of rabies occurred in non-vaccinated dogs.

In 1919 in Tokyo Prefecture, 15,513 dogs were vaccinated of which one died after vaccination and one contracted rabies. In that year there were about 20,000 registered pet dogs, of which 13,177 were vaccinated during the seven months from May to December. During the six months from October, 1919, to March, 1920, there was about one-half of the total number of rabid dogs which had appeared during the corresponding six months of the preceding year, and likewise the total number of persons bitten was, during the former period, only about one-half of that for the latter period. All the rabid dogs except the one case of the vaccinated dog mentioned above were non-pet dogs.

From these practical experiences with rabies vaccination in dogs the authors conclude that the most rational method for the prevention of rabies would consist in killing all non-pet dogs and vaccinating all pet dogs. L. T. GILTNER.

EUGENICS FROM VETERINARY STANDPOINT. S. J. Bonansea. Revista Mexicana de Biologia, vol. 1, No. 3 (1921), p. 116. Abst. in Jour. Amer. Med. Assoc., vol. 76, No. 22 (May 28, 1921), p. 1,540.

Bonansea has been studying the effect in cows of parenteral injections of autogenous milk and in other animals, of the injection of organ extracts and lecithin. He found the litters larger when the males had been kept fasting for 24 hours before being put with the females. Parenteral injection of the cow's own milk increased the output of milk by two and a half quarts a day. These injections did not cause any disturbance unless the cow was diseased, in which case they seemed to whip up the latent disease. When the rabbits and guinea-pigs were injected with

lecithin just before being placed with males that had been fasting for 24 hours, the litter contained only from 27 to 39 per cent males instead of the usual 63 to 70 per cent. He gives other practical suggestions for veterinary practice, and ascribes the failure of organotherapy in certain cases to the fact that the extracts were derived from the opposite sex.

A TEST FOR THE PRESENCE OF ABORTION INFECTION IN CATTLE BY THE PRECIPITIN REACTION OF SACHS-GEORGI. Sachweh and Rösner. Deut. Tier. Woch., vol. 28 (1920), No. 30, pp. 345-349.

Without a control reaction, the agglutination test for the diagnosis of infectious abortion in cattle and horses is yet possible. Frequently, however, obscure results occur due to the varying reactions of the abortus strains and the serums. Apart from the agglutination test as a control, the precipitin reaction of Sachs-Georgi is very useful, a positive precipitate proving the presence of abortus infection even following a typical or negative agglutination test. The precipitin reaction is the most accurate test for abortion and is much superior to the agglutination method. A further advantage of the precipitin reaction is its simplicity of application. J. P. O'LEARY.

SUBCUTANEOUS USE OF PURGATIVES. Galliard, et al. Revue Scientifique, April 18, 1919. (Abst. by P. B. in Revue Vétérinaire, vol. 72 (1920), p. 108).

A number of purgatives can be administered subcutaneously. In the first place may be mentioned natrium sulphuricum and magnesium sulphuricum, which are given in doses of 1 c.c. of a 25% aqueous solution, to the human subject. This method can be applied in canine practice when the administration per os is rendered difficult. The injections are to be repeated for several days in succession when necessary. J. P. O'LEARY.

VITAMINS IN MILK. M. J. Rosenau. Boston Med. and Surg. Jour., vol. 184, No. 18 (May 5, 1921), p. 455. Abst. in Jour. Amer. Med. Assoc., vol. 76, No. 22 (May 28, 1921), p. 1531.

One of the newer facts recently disclosed is that milk is not equally rich in all vitamins, but contains these essential acces-

sory dietary factors in variable amounts. The antiscorbutic value of milk depends almost entirely on the fodder of the cow. The quantity of vitamins in plants probably varies with the soil in which they are grown, and animals in turn suffer by lack of, or profit by richness of, vitamins in plant foods. Milk is usually rich in all three vitamins. It is unusually rich in fat-soluble A, contains an abundant amount of water-soluble B, and a variable but ordinarily sufficient quantity of antiscorbutic vitamin. Therefore it protects against all of the known deficiency diseases.

It has long been known that the effect of heat on vitamins varies with the reaction and other factors. Most vitamins are more readily affected by heat in an alkaline medium than in an acid one. Fortunately, most foods are acid. Milk is acid from the time it leaves the udder. With regard to the effect of heat upon antiscorbutic vitamin, it has been shown that the duration of the heating process is of greater importance than the degree of temperature to which the food is subjected. Dry milk may retain its antiscorbutic virtue in spite of drying, canning and aging, especially if well packed and hermetically sealed. It loses its potency after it is exposed to the air. Canned milks and dried milks, then, retain the fat-soluble A and water-soluble B vitamins in almost their original potency. The only vitamin in these preparations that may be affected is the antiscorbutic vitamin. The amount of this in canned milk will vary with many factors, primarily, the amount in the original milk, and secondarily, on the process of heating and evaporation, with special reference to oxidation.

TUBERCULOSIS IMMUNIZING VACCINE. N. Raw. Brit. Med. Jour., No. 3,147 (April 23, 1921), p. 594. Abst. in Jour. Amer. Med. Assoc., vol. 76, No. 22 (May 28, 1921), p. 1534.

Since 1906 Raw has subcultured every month human bovine and avian tubercle bacilli. The present growths represent the one hundredth and eighty-fourth generation. The growths are still profuse and true to type, but they are quite nontuberculigenic and completely nonpathogenic to animals. Every year since 1906 Raw has injected these bacilli into animals with a view to testing their pathogenicity. Until the ninety-fourth generation of subcultures, no change in virulence was noted. After that time attenuation became marked, and in a year or two the cultures were avirulent.

Treatment of disease by vaccines prepared from organisms attenuated naturally means that the production of antibodies will take place rapidly without any preliminary shock to the system such as invariably follows the injection of a vaccine prepared from a virulent strain of bacteria.

With a view to elucidating the real amount of tuberculosis in man caused by the human and bovine types of bacilli, and also as to immunity produced by one infection toward the other, Raw instituted clinical observation on a large scale in a Liverpool hospital containing 900 beds, of which he had sole charge for 18 years. In no case of primary pulmonary tuberculosis did he observe during the course of illness tuberculosis of bones, joints, glands, or skin, nor any instance of meningitis. Among the surgical cases of tuberculosis 28 developed lung symptoms; 25 died. In all cases the infection of the lung was either by direct extension from cervical glands to the apex of the lung, or from a primary focus in the abdomen extending upward through the diaphragm to the bronchial glands and lungs. This large clinical experiment convinced Raw that the human body is attacked by two quite distinct forms of tuberculosis—the one conveyed from person to person by direct infection and attacking chiefly the lungs, or so-called consumption, and the other conveyed by milk from tuberculous cows, and developed in the first few years of life. These two disease are caused by different types of tubercle bacilli which will not live in the body at the same time and, what is of the highest importance, one disease produces immunity to the other. Hence Raw always uses a vaccine prepared from bovine cultures in the treatment of the human infections and vice versa.

The vaccine which he has had prepared from his attenuated cultures is a bacillary emulsion of the bacilli, and contains all the products of the bacillus. It is nontoxic and avirulent, and produces no reaction even in large doses. For purposes of immunization in susceptible children six injections are given at weekly intervals, and repeated in three months. The doses recommended are 0.001, 0.002, 0.003, 0.004, 0.005 and 0.006 mg. No symptoms whatever have been observed to follow these injections. In the treatment of the active disease the doses used are much larger than have been possible hitherto; it is recommended that the treatment should consist of at least 12 injections given in increasing doses at intervals of seven days. The doses commence at

0.001 and increase to a maximum dose of 0.025 mg. The vaccine should be freshly prepared from the cultures and should not be used after one month. This vaccine, prepared as it is from avirulent cultures, can be used with complete safety in any stage of the disease, and even in advanced cases great relief from night sweats, toxic symptoms and erratic temperatures has been noted. The results in suitable cases are excellent.

Raw has succeeded in completely immunizing highly susceptible animals against tuberculosis by the use of attenuated cultures which have required 14 years' subculturing in the laboratory, and he firmly believes that if all children with a tuberculous history could be safely vaccinated in the manner described they would be placed in a better position to resist infection at home.

TREATMENT OF SEPTIC METRITIS WITH ANIMAL CHARCOAL. Reisinger, Heller and Versinger. Allatorvosi lapok snag (veterinarius), vol. 42, p. 102.

The successful treatment of acute and chronic enteritis with animal charcoal encouraged the writers to perform some experiments with animal charcoal on cows affected with septic metritis, which was well indicated on account of the fact that the present method of treatment in these cases by irrigation with various antiseptic solutions, did not give the expected results. Wiechofski and his co-workers deduced from thorough investigations that animal charcoal acts not only physi-chemically on the morbid substances and absorbs bacteria, but forms an irreversible mixture, which has a prohibitive effect on inflammatory and putrefactive processes. Therefore, from its use, particularly in septic metritis, good results can be expected. At the time of this experiment an article was published along the same line by Novak, in which he described excellent results from the use of animal charcoal in septic metritis in women. Out of two cases, one case with one treatment of animal charcoal resulted in complete recovery, while in the other, visible improvement was noted.

The authors of this article experimented on 14 cows with septic metritis, eight cases having retained placenta, which had to be removed by physical force. In two cases infection resulted from difficult parturition, where the assistance was given by laymen, while the other four presumbably followed normal pregnancies with properly passed placentae.

The treatment of all of these cases was the same. The uterus was cleansed with warm sterilized water (in cases where removal of the placentae was necessary they were removed mechanically), then drained, then washed with a fluid paste made from animal charcoal in the proportion of 1 to 25 parts of water, well mixed. The quantity of charcoal was varied to the size of the uterus. The average dose was 50 grams of charcoal to one liter of water. In cases where the uterus was slightly or not at all contracted, larger doses were given, from 100 to 300 grams to the liter of water.

All these 14 animals used for this experiment recovered within a period of 8 to 17 days. In one case infected with bacillus of Bang, only one treatment was necessary. In three cases, two; in four cases, three; in two cows, four; in four cows, five applications were necessary. The improvement was very noticeable in cases where the metritis had produced general systemic conditions. The temperature after one charcoal treatment was reduced to normal; the appetite and lactation were also improved. It is also worthy to be mentioned that none of these animals developed arthritis (in hock joints), which is such a common complication to septic metritis.

The animal charcoal will not irritate the mucous membranes. Therefore, it can be used with good success in catarrhal, as well as septic metritis. Out of nine cases of catarrhal metritis, three recovered from one administration of charcoal; three from two; one from three; one from four; and in the last five irrigations were necessary. In two cases of pyometritis, one required two and the other three irrigations to effect a complete recovery.

M. BORSOS.

Dr. and Mrs. Wm. Henry Kelly, of Albany, who have been spending the summer at their cottage at Round Lake, were recent visitors to Saratoga Springs.

Farmers near Lexington, Kentucky, have found that using a bridle on cows prevents them from bloating on alfalfa pastures. —*Wallace's Farmer.*

ARMY VETERINARY SERVICE

MORE ABOUT THE ARMY VETERINARY CORPS

To the Editor:

I note in our issue of May, 1921, a letter from J. B. Robinson regarding the Army Veterinary Service. The writer, after proving his competency by presenting his credentials as "a graduated veterinarian," and as one of the wartime "line officers" proceeds to offer "a few impressions" about the Army Veterinary Corps.

It is amusing how his opinion was formed about the old army veterinarians. He remembers two of them: "One at a camp in a northwest State, the other one I saw but once, but heard a lot about him." So much for the old army veterinarians. The younger veterinarians he "had occasion to size up," and he decided that when the time comes for them "to handle big problems, something is going to "break." Gentlemen, why all this trouble about personal contact, and rigid examinations, just "size them up" and you will know all about them.

The "critic" fails to realize that the Veterinary Corps is but in the process of formation. To compare it with the Bureau of Animal Industry, an organization that has over 30 years of experience in back of it, is ridiculous. While it is true that the Bureau, by the very nature of things, has produced, and has with it brilliant men, it is equally true that the average Bureau veterinarian is of no higher professional attainment than the average army veterinarian. Judging by examinations that I have taken both for the Bureau and the Regular Army, the latter is more critical as to its personnel. I would suggest that J. B. Robinson, after considerable coaching, attempt to enter the Regular Army. He would be surprised to discover that it takes more than lack of pride to do so.

Those unfamiliar with army conditions fail to realize that in addition to administrative ability, and professonal knowledge, a director of the Army Veterinary Service must have army experience—actual contact with the army for a considerable length of time. This, in my opinion, is the probable reason, why our beloved Doctor David White, admittedly a big and capable man, failed to fill the place as Chief Veterinarian, A. E. F., with entire satisfaction. Regarding the "bulldozing" of line officers one must not forget that the Veterinary Corps, just like the Med-

ical Corps, is but an auxiliary to the army, and not an independent organization.

The fact is that the Veterinary Corps has some very promising material, and, considering its youth, is developing a marvelous efficiency which will be the pride of the veterinary profession. To inject the element of discord, and the offering of destructive criticism by one of the profession, who "had too much pride" to belong to the Veterinary Corps, is strongly resented.

LOUIS G. WEISMAN,
First Lieut. Veterinary Corps, U. S. Army.

Fort Huachuca, Arizona, June 11, 1912.

At the Army remount station, Fort Reno, Okla., there are 2,000 animals, including 400 brood mares, which have been under the sanitary supervision of Captain W. H. Houston, of the Veterinary Corps. There are also about 30 stallions which are available for the farmers and ranchers in that community for public service. Captain Houston has been very successful in controlling infectious abortion which has prevailed at Fort Reno for the last few years. The causative organism has been isolated from these mares by the Army Veterinary Laboratory in Washington, D. C., where a bacterin was prepared for the inoculation of infected and exposed animals. The mares were injected on the fourth and ninth months of pregnancy and carried their foals to full time. It is reported that a mare which is negative to the complement-fixation test before the injection will give a 4 plus reaction after a small injection of the bacterin and will hold this reaction for months afterward. Last year there were as many as 8 abortions a week, but after the second injection of 2 c.c. of the bacterin all abortions stopped suddenly and no more have occurred.

According to a New York paper four men in Newton, Kansas, had their arms broken in trying to crank a motor-car. It is thought that the car must have been bitten by an Army mule.—*London Punch.*

French military authorities have discovered that seaweed makes an excellent substitute for oats as fodder. Particularly in the Remount Division of the Horse Marines.—*Life.*

ASSOCIATION NEWS

PENNSYLVANIA VETERINARY ALUMNI MEETING

About 100 alumni of the Veterinary Department of the University assembled at the Veterinary School on Alumni Day, June 11, 1921.

During the morning interesting and instructive clinics and the judging of horses were conducted by members of the teaching staff. A business meeting was held in the Veterinary School Library between 12 m. and 1.30 p. m. At 2 p. m. dinner was served in Leonard Pearson Hall, after which the veterinary alumni joined the parade to Franklin Field to attend the ball game. Some of the members attended other alumni day functions.

The Class of 1887 was the oldest class represented and all classes since that time, with the exception of 1889, 1890, 1891 and 1893, were represented. The Class of 1916 had the highest number present.

Among those present were the following:

Dr. Robert Formad, of the Class of 1888, who was an instructor in Normal and Pathological Histology at the School of Veterinary Medicine for several years. Having taught several classes he is known to a large number of graduates. He is now with the Pathological Division of United States Bureau of Animal Industry.

Dr. W. H. Ridge, of the Class of 1888, taught Veterinary Obstetrics in the early days of the school and is now with the Pennsylvania Bureau of Animal Industry.

Dr. Charles Williams, of the Class of 1887, taught Theory and Practice before Leonard Pearson served as a teacher of that subject.

Dr. C. J. Marshall, of the Class of 1894, was a successor to Leonard Pearson as Pennsylvania's State Veterinarian and Professor of Theory and Practice. He served during the World War as Lieutenant Colonel in the Veterinary Corps and at the present time is back at his old post as Professor of Veterinary Medicine. He organized and is in charge of the Ambulatory Clinic.

Dr. T. E. Munce, of the Class of 1904, is State Veterinarian of Pennsylvania.

Dr. H. C. McNeil is State Veterinarian of New Jersey.

Dean L. A. Klein and all members of the faculty were present.

The entire day was spent with great interest to all and many old friendships were renewed.

The following were elected to office for the ensuing year: President, S. H. Gilliland, of Ambler, Pa., also Representative on General Alumni Board.

First Vice President, W. A. Haines, of Bristol, Pa.; Second Vice President, John R. Mohler, of Washington, D. C.; Secretary and Treasurer R. M. Staley, of Philadelphia, Pa.; Historian, E. C. Deubler, of Ithan, Pa.

C. S. ROCKWELL, *Resident Secretary.*

MICHIGAN TUBERCULOSIS CONFERENCE

The Michigan Tuberculosis Conference held at East Lansing June 22 to 24 brought out more veterinarians of the State than any meeting ever held in the past. All told, there were present 300 of the 475 veterinarians in the State. It was the consensus of opinion that it was a really worth while meeting and it was suggested by some that a similar conference be held each year.

The conference was conducted by the Veterinary Division of the Michigan Agricultural College assisted by the State Department of Animal Industry and the local branch of the Bureau of Animal Industry. Dr. F. W. Chamberlain, Acting Dean of the Veterinary Division, presided at all sessions, and Dr. T. S. Rich, in charge of tuberculosis eradication work in Michigan, represented the Bureau.

Members of the college faculty and representatives of the State Department of Animal Industry and of the Bureau of Animal Industry talked on all phases of tuberculosis eradication. In addition to this subject some time was given over to the discussion of hog cholera and sheep scabies.

One evening session was held at which Dr. R. M. Olin, Commissioner of the State Department of Health, Mr. H. W. Norton, Commissioner of Animal Industry, and Hon. H. H. Halladay, Commissioner of the State Department of Agriculture, were the principal speakers. At the close of the latter's address he announced the appointment of the new State Veterinarian, Dr. B. J. Killham, and the new State Examining Board, which is to consist of the State Veterinarian, together with Dr. B. A. Perry and Dr. E. T. Hallman. Mr. Halladay called all three appointees to

the platform and introduced them amidst great applause. Following this the B. A. I. educational film, "Out of the Shadows," was thrown upon the screen.

On the day following the conference, the Federal examination on tuberculosis was conducted at the college by Dr. Rich and his assistants. Most of the attending veterinarians remained for this examination. It required three large lecture rooms to seat them.

R. A. RUNNELLS, *Secretary.*

WASHINGTON, OREGON, IDAHO AND BRITISH COLUMBIA VETERINARY MEDICAL ASSOCIATIONS

A meeting of the above associations was held in Seattle, Washington, July 14 and 15, 1921.

This was a most successful conference of the veterinarians of the Northwest, there being 70 veterinarians present.

The meeting was called to order and a few opening remarks were made by Dr. R. A. Button, President of the Washington Association. He called upon Corporation Counsel Meyers of the City of Seattle to give an address of welcome, which he did in a few well-chosen words. Dr. Cook, of Brownsville, Oregon, replied.

Dr. Button then introduced Dr. W. Coon, of Forest Grove, Ore., President of the Oregon State Association, whom he asked to preside at the meeting. Dr. Coon accepted the honor with a few words and then called upon Dr. W. Brookes, of Duncans, B. C., who spoke on the subject of "Veterinary Hygiene and Sanitation in Relation to Dairy Cattle and Their Products." Discussion was opened by Dr. L. Pelton, of Olympia, Wash.. and followed by Drs. R. Lytle, Button and Howell.

The next paper was one read by Dr. J. H. Woodside, of Redmond, Wash., on the "Methods of Removing Retained Placenta in Cows." Discussion was opened by Dr. A. Damman, of Vancouver, B. C., and followed by Drs. Cook, Howell, Donohue, Keown, Jagger, Ackley, Selander, Button and Simms.

Then followed an address by Mr. J. L. Peterson, of the U. S. Forest Service, on "Poisonous Plants on the Range," illustrated by lantern sides. Voluminous figures were given showing the area of the forest ranges, the number of stock on them, etc., and concluded by showing natural size pressed specimens of the poisonous plants. Discussion was by Drs. Fuller and Reagan.

In the afternoon the session was opened by a paper entitled,

"A Few Case Reports on Sterility in Cattle," by Dr. P. Mackintosh, of Yakima, Wash. Discussion was opened by Dr. Jagger, President of the B. C. Veterinary Association, and continued by Drs. Saperstein, C. Philips, R. Donohue, F. Hendrickson, B. Simms and J. Cook.

Dr. J. R. Fuller, of Walla Walla, Wash., then read a paper on an uncommon condition entitled, "Harvest Pneumonia in Horses," and discussion was by Dr. E. E. Wegner, of Pullman, Wash.

Dr. T. E. Sleeth, of Vancouver, B. C., then presented different lantern slides prepared by himself, showing different breeds of dogs and pointed out the different points and lines indicative of the presence of quality and type in dogs for show purposes. His object was to assist veterinarians, who often have dogs brought to their office and are asked if such a dog is worth exhibiting or could be fitted up for show purposes, so they would be able to give an intelligent answer. General discussion followed.

The next was a talk by Dr. A. Saperstein, of Ferndale, Wash., on "Operations to Remove Teat Strictures." Discussion was by Drs. C. Philips, Howell, Cook, Jagger and Carter.

The first paper the next morning was one by Dr. C. S. Philips, of Mt. Vernon, Wash., on the subject of "Mastitis." Discussion was opened by Dr. C. Cozier, of Bellingham, Wash., and continued by Drs. J. Hendrickson, G. Howell, Jones, Carter, Roberts, Chester, Coon, Miller and Keown.

The next was a paper of growing importance to the veterinarian, "Diseases of Poultry," by Dr. W. T. Johnson, of Puyallup, Washington, which was illustrated by beautiful lantern slides. Discussion was by Drs. Howell and Ackley.

In the afternoon Dr. L. Pelton, of Olympia, Wash., gave an address on "Hog Cholera and Allied Diseases." Discussion was opened by Dr. J. Frank and continued by Drs. Howell, Jagger, Hess and Chester. Mr. Ringer, of the Pacific Hog Ranch, by invitation, gave some interesting remarks on his experience with hog cholera and different hog diseases, and the use of serum and virus.

On invitation of the Chairman, the various associations adjourned for one hour to discuss their respective association affairs and, after convening again, Dr. E. Derflinger, of Eugene, Ore., read a paper of great interest to inspectors on "Types of Tuberculin Reactions and Location of Lesions Found on Au-

topsy.'' Discussion was by Drs. M. Sparrow, Lytle, Donohue and Ackley.

Adjournment was taken at 6 p. m., and on meeting again at 8 p. m. the first paper was one by Dr. R. Button, of Tacoma, Wash., on ''Some Peculiar Cases Met in General Practice.'' Discussion was by Drs. Philips, Fuller, Cook, Howell, Howard, Keown, Fullington and Strong.

Dr. G. A. Jones, of Sedro-Woolley, Wash., then read a paper on ''Panaritium in Cattle,'' on which there was a general discussion.

This was followed by a paper by Dr. B. Simms, of Corvallis, Ore., on ''Some Experiments with Contagious Abortion in Cattle.'' This very interesting paper was fully discussed by Drs. Miller, Hendrickson, Donohue, Coon, Howell, Derflinger, Woodside and Fuller.

Dr. Cozier, of Bellingham, Wash., then read an amusing paper entitled ''Some Useful Therapeutic Preparations,'' written by Dr. E. T. Baker, of Moscow, Idaho.

The final paper was one by Dr. E. E. Wegner, of Pullman, Wash., on ''Some Phases of Veterinary Surgery,'' and was discussed by Drs. Damman, Cook, Moorehouse, Button and Fuller.

At the end of the morning session, Dr. T. H. Jagger, President of the British Columbia Veterinary Association, with a few well-chosen remarks, invited the Northwestern Veterinarians to meet next year in Vancouver, B. C., at a date to be arranged by the different secretaries. Dr. L. Pelton moved that this invitation be accepted. This was seconded by Dr. Cook and on the question being put, was unanimously carried.

Dr. K. Chester, Secretary of the British Columbia Association, introduced the following resolution:

Whereas, On account of the importance of the consumption of milk, meat, fish and other food products;

And Whereas, The consumption of these foods, if tainted, is often the cause of ailments and disease of human beings;

And Whereas, The members of the medical profession, by their lack of knowledge and training in the anatomy, physiology and pathology of domesticated animals, are not competent to inspect such foods and thus protect the public from such ailments and diseases;

Be it Resolved, That this meeting of Northwestern Veterinarians go on record that it is necessary that all veterinary colleges should give a post-graduate course to qualify veterinarians as veterinary health officers; *and be it further resolved*, That in the opinion of this meeting all cities, towns and municipalties should appoint a veterinary health officer.

This resolution was discussed by Drs. Philips, Brookes, Wegner, Strong and others and was carried unanimously.

I have not attempted to describe any of the papers as this would make the report too long, but it is a pity that the veterinary profession as a whole could not get the contents of some of the above papers, and it would not be fair to refer to one and leave out others.

The meeting seemed like a post-graduate course, crammed into two days and I am sure no veterinarian in attendance could feel that any of his valuable time was wasted. We hope to have as good a meeting next year in British Columbia.

K. CHESTER, *Secretary,*
B. C. Veterinary Association.

WEST VIRGINIA VETERINARY MEDICAL ASSOCIATION

A meeting of the West Virginia Veterinary Medical Association was held in Parkersburg, W. Va., July 7 and 8. The election of officers resulted in the selection of Dr. W. E. Langford, Keyser, W. Va., President; Dr. W. B. Alford, Weston, W. Va., Vice President; Dr. C. T. Higginbotham, Charleston, W. Va., Secretary and Treasurer.

Dr. J. F. Devine was present and gave a lecture on abortion and sterility, followed by a demonstration on the method of making an examination of a cow suspected to be sterile. The subject used was a cow which has been sterile for three years.

The afternoon of the last day was spent in demonstrating the combined intradermal and ophthalmic tuberculin test by Dr. H. W. Turner, of Pennsylvania.

A herd of 28 dairy cows had been injected and the eye sensitized previously by Dr. F. M. Johnson and Dr. F. E. Johnson, of the B. A. I. force. No reactors were found, much to the dissatisfaction of the members in attendance.

The lectures of Drs. Devine and Turner were well received and very much appreciated by the veterinarians present and we felt well repaid for our trip to this meeting.

Dr. G. C. Melody was present and extended an invitation to visit his farm near Deer Park, Md., where he is arranging for a clinic on August 7 and 8, 1921.

C. T. HIGGINBOTHAM, *Secretary.*

AUSTRALIAN VETERINARY ASSOCIATION

The inaugural meeting of the Australian Veterinary Association was held in the Lecture Hall of the School of Veterinary Science, Melbourne University, on January 12, 1921. It was preceded by a meeting of veterinarians called together by the Honorary Organizing Secretary, who, in so doing, briefly outlined the steps taken in 1914 towards the formation of the association, and referred to a previous attempt to form such an association in 1880. One member of that association was present at this meeting in the person of Dr. W. T. Kendall.

The Organizing Secretary called for nominations for a Chairman for the meeting, and Professor H. A. Woodruff was nominated, seconded, and duly elected.

The Chairman requested the Organizing Secretary to read out the proposed procedure for the holding of the inaugural meeting. This was done. The Chairman then called for nominations for a Credentials Committee of not more than three, to examine the credentials of those present, and of any proxies held by them.

Messrs. Woodruff, Kendall and Henry were appointed to act.

The conference then proceeded to the election of members in accordance with Resolution 4 of the conference of January, 1914, as modified by authority of the State associations, and embodied in the procedure for the inaugural meeting.

Conference then proceeded to the ratification of the suggested rules as drafted at the conference of 1914, and modified by authority of the State association. The proposed rules were dealt with seriatim, and many amendments made. The provisional rules having been ratified and accepted as amended by the conference then in session, the Chairman declared the first general meeting of the Australian Veterinary Association to be in session.

After the meeting adjourned, a meeting of the Council was held, at which the following officers were elected: President, Professor J. Douglas Stewart; Vice-President, Professor H. A. Woodruff; Treasurer, S. T. D. Symons; General Secretary, Max Henry.

The Council decided that nominations for Council and membership from Western Australia and Tasmania, delayed owing to the strike, should be considered as valid.

The Council approved of payment of incidental expenses in

connection with the inaugural meeting to be made a first charge on the funds of the association.

It was decided to hold the second meeting of the Australian Veterinary Association at Sydney in Easter Week, 1922.

MAX HENRY, *Secretary.*

ROYAL COLLEGE OF VETERINARY SURGEONS

The seventy-eighth annual general meeting of the Royal College of Veterinary Surgeons was held in the Royal Dick Veterinary College, Edinburgh, on June 2, Dr. O. Charnock Bradley presiding.

The Chairman, before proceeding with the ordinary business of the meeting, pointed out that only twice previously had they met in Edinburgh—in 1880 and in 1904. On only four occasions had the meeting been held out of London. He thought he was justified in saying that the Scottish members of the profession greatly appreciated the departure from the usual custom. They also appreciated the courage of those English members who had braved the difficulties of traveling at the present time.

The annual report of the Council stated that the net number of individual students examined during the year was 523, compared with 271 in 1919 and 158 in 1918. The Registration Committee dealt with 28 formal complaints, in ten of which, however, there was no case for action. Two members were called to appear before the Committee on charges of unprofessional conduct. In one case the Committee found the charge not proven, and in the other it has recommended the removal of the member's name from the register. Two unqualified persons were prosecuted for infringement of the Veterinary Surgeons Act, and convictions were obtained. The Council appointed a Special Committee to consider and report as to whether the exclusion of professors and of members who are not Fellows from the Boards of Examiners for the membership diploma under the charters of 1844 and 1876 are obstacles to the development of veterinary education and the advancement of the profession. The Committee presented a report to the effect that the question in each case must be answered in the affirmative, and recommended a scheme by which the *bona-fide* or principal teacher of a subject should act as an internal examiner, unpaid, in addition to the two external examiners. The Committee also expressed the opinion that it would be

in the best interests of the profession to throw open the appointment of examiners to the whole profession. The Parliamentary and General Purposes Committee considered all Parliamentary Bills affecting the profession. In the case of the Dangerous Drugs Act, representations have been made to the Home Office urging amendments to the regulations made under the Act, so as to provide that veterinary surgeons may be placed, as regards the use of dangerous drugs in the treatment of diseased or injured animals, on the same footing as are medical practitioners as regards the use of these drugs in human medicine. The statement of account shows that the sum of $1,335 was received during the year 1920-21 in voluntary subscription. In addition to this amount, the sum of $4,170 was received from members' subscriptions. The War Memorial Fund amounts to $4,810. A memorial tablet has been erected in the entrance hall of the college.—*From "The Scotman," Edinburgh.*

NORTHWEST NOTES

Dr. E. E. Wegner, who has been Vice Dean of the Veterinary Department of the Washington State College for the last two years, has been honored by being promoted to the Deanship. Dr. Wegner is a graduate of the Washington State College of the class of 1908, and with the exception of two years in the Government Service, has been a Professor in the Veterinary School at his Alma Mater.

Governor Louis F. Hart, of the State of Washington, recently appointed a new Board of Veterinary Examiners. Those upon whom this new honor has fallen are Drs. P. G. McIntosh, of Yakima; H. A. Trippier, of Walla Walla, and A. R. Galbraith, of Garfield. The first examination under the new Board was held in Spokane beginning June 17.

Commencement exercises of the Washington State College were held in the College Auditorium June 16th. Among the graduates were 12 from the Veterinary Department.

A movement is on foot to bring the 1924 A. V. M. A. meeting to the Pacific Northwest. The city most likely to apply for it is Spokane, Washington. Spokane is a town of over 100,000 population and can very easily handle a meeting of this kind.

A. R. GALBRAITH, *Resident Secretary.*

NECROLOGY

ANOTHER OF THE "OLD GUARD" HAS ANSWERED THE LAST ROLL

THE MEMBERS of the veterinary profession throughout the country will learn with sincere regret of the death of Dr. William Horace Hoskins. For some time previous to his death he had been suffering from an affection of the heart, which terminated fatally on August 10 at his home, 135 East 30th Street, New York City. Undoubtedly there was no man in the profession who enjoyed a wider and closer acquaintance among the veterinarians of the country than Dr. Hoskins.

DR. W. HORACE HOSKINS

He was born in Rockdale, Pennsylvania, July 23, 1860. His early education was received in the public schools, and in 1881 he graduated from the American Veterinary College of New York City. The greater part of his life was spent in Philadelphia, where he practiced his profession. In connection with his practice he edited the *Journal of Comparative Medicine and Veterinary Archives,* and for a number of years he filled the chair of veterinary jurisprudence, ethics and business methods in the Veterinary Department of the University of Pennsylvania, until 1917, when he became dean of the New York State Veterinary College at New York City and professor of jurisprudence and clinical medicine in that institution.

He was identified with various civic and scientific organizations, including the American Veterinary Medical Association, the Pennsylvania State Veterinary Medical Association, the

Keystone Veterinary Medical Association, and was elected to honorary membership in the Missouri Valley, the Virginia State and the New Jersey State Veterinary Medical Associations and the New York County Veterinary Medical Association. He was ex-president and ex-secretary of the Pennsylvania State Board of Veterinary Medical Examiners. He always took a deep interest in local, State and national politics and was nominated by his party for Mayor of Philadelphia in 1899. He was prominent in Masonic circles, being a member of Ivanhoe Lodge, St. John's Chapter, Corinthian Chasseur's Commandery, Philadelphia Consistory and the Mystic Shrine.

As a successful practitioner Dr. Hoskins ranked among the foremost in the United States, but he was never too busy nor too fatigued to take an active interest in all movements intended to elevate and promote the profession. He was an ardent advocate of a high standard of veterinary education, and his articles in veterinary publications and addresses before public gatherings accomplished much in helping to raise our standard to where it now is. He devoted much energy and time for twenty-five years to secure legislation in the interest of the Army veterinary service, and what has been accomplished was largely through his persistent efforts.

Those who attend the meeting of the A. V. M. A. at Denver this year will greatly miss Dr. Hoskins, as he has established the unprecedented record of having been present at every meeting of this Association for the last 39 consecutive years, and has always taken an active part in its proceedings. Realizing the potential possibilities of such an association, national in character and far-reaching in influence and power for good, he gave his best without stint of zeal or time to help make it the useful and respected organization that it has become.

Dr. Hoskins was honored with the presidency of the American Veterinary Medical Association from 1893 to 1896 after serving as its Secretary for the previous five years, and has constantly served the Association through appointments on important committees. He was recognized as one of the most fluent, fearless speakers, resourceful debaters and accomplished parliamentarians in the Association; he never harbored ill feeling in defeat, and his literary contributions to programs were always a source of pleasure and profit to the members.

The latter years of Dr. Hoskins's life were spent principally as an educator and he proved as successful in this line, particularly in securing substantial endowments for his work, as in other undertakings. His kind, sympathetic nature led him to note the sufferings among the poor in the great metropolis where he resided, and he became identified with community welfare in the poor sections of New York City. Through the death of Dr. Hoskins the profession suffers the loss of an outstanding practitioner, higher veterinary education an ardent advocate, the veterinary college an eminent instructor, veterinary literature a valuable contributor, the B. A. I. and the Army veterinary service a staunch supporter, the A. V. M. A. a faithful, energetic worker, the country a loyal, patriotic citizen, and most of us in the profession have lost a dear, unselfish personal friend.

He is survived by his widow, Mrs. Annie Evans Hoskins; one daughter, Mrs. Julius M. Hofstetter, and two sons, Dr. H. Preston Hoskins and Cheston M. Hoskins, both of whom have followed their father's profession.

The JOURNAL joins the many friends of Dr. Hoskins in extending sincere sympathy to the members of his family in their sad bereavement.

It is with deep regret that we announce the death on July 25 of Dr. Edward A. A. Grange, who for many years enjoyed a wide acquaintance among veterinary practitioners, educators and research workers in this country and abroad.

Dr. Grange was of Irish descent. Although he was born in London, England, his parents spent most of their lives in Canada. His early education was obtained at private schools, and in 1873 he graduated from the Ontario Veterinary College with the degree V. S. His M. Sc. degree was conferred in 1908. From 1875 to 1882 he lectured at the Ontario Agricultural College, and from 1883 to 1897 he was professor of veterinary science in the Michigan Agricultural College, where he performed some of his most important work. In 1897 he became principal of the Detroit Veterinary College, which position he held for about one year. From 1898 to 1908 he engaged in veterinary research work in the State of New York, but at the end of 1908 he returned to Canada as principal of the Ontario Veterinary Col-

lege, which position he acceptably filled until a few years ago, when he resigned.

During his lifetime Dr. Grange made many valuable contributions to veterinary literature in the form of bulletins and essays. Notable among his bulletins are the following: "Milk Fever," 1883; "Observations on a Disease Affecting the Eyes of Sheep," "Laminitis," "Dourine," and "The Horse's Foot," 1887; "Experimental Work Among Cattle," 1888; "Foot-Rot in Sheep," "Glanders and Farcy," 1891; "External Conformation of the Horse," 1894. He was a member of the American Veterinary Medical Association and numerous other veterinary and scientific societies. He read many valuable papers before the American Veterinary Medical Association, including "Disinfection," 1899; "Care and Comfort of Domestic Animals Under Varying Conditions," 1902; "Nervous Influence in the Cause and Cure of Disease," 1909; "Topics Relating to Veterinary Education," and "Field Work in the Training of Veterinary Students," 1912.

Dr. Grange was one of the most accomplished veterinarians and educators in America. He was beloved and respected both in and out of his profession, and his influence as a teacher and practitioner will survive him many years and will be reflected in the practice of those who received his teachings and strive to emulate his worthy example.

Dr. Wallace Calvin Abbott, who died at his home in Chicago, on July 4, was born in Bridgewater, Vermont, October 12, 1857. His early education was obtained at the State Normal School, Randolph, Vermont, the St. Johnsbury Academy, St. Johnsbury, Vermont, and Dartmouth College, Hanover, New Hampshire. Moving West, he worked his way through the University of Michigan, winning his degree as Doctor of Medicine in 1885. The following year he engaged in the practice of medicine in Chicago, building up a large practice on the North Side and winning many friends.

It was during this time that Dr. Abbott established The Abbott Alkaloidal Company, now known as The Abbott Laboratories, of which firm he was President continuously from the time of its establishment, more than 30 years ago, until his death.

Doctor Abbott was a man of broad vision and great energy. He was an organizer of rare ability, warm-hearted and beloved by

his associates, and was deeply interested in the advancement of the veterinary profession.

Dr. Alfred S. Burdick has been selected to fill the vacancy caused by the death of Dr. W. C. Abbott.

He is a graduate of the Alfred University, Alfred, N. Y., and Rush Medical College, Chicago.

Among the many friends of the late Dr. W. Horace Hoskins who accompanied the body to its last resting place at Rockdale, Pa., were Dr. S. Brenton, Detroit; Dr. George H. and Miss Nellie Berns, Brooklyn; Dr. and Mrs. Harry B. Cox, Drs. C. A. Schaufler, M. J. Maloney and W. H. Ivens, Philadelphia; Dr. W. L. Rhoads, Lansdowne; and Drs. J. P. Turner, U. G. Houck and J. R. Mohler, of Washington, D. C.

CHANGES IN STATE VETERINARIANS

Additional changes recently made by several States in the office of State Veterinarian are as follows:

Utah—Wm. A. Stephenson replaces R. W. Hoggan.

Illinois—F. A. Laird succeeds A. T. Peters.

Ohio—Bruce Edgington takes the place of T. A. Burnett.

New Hampshire—Robinson Smith has been selected for the newly created position of State Veterinarian.

Rhode Island—T. E. Robinson has been appointed as the successor of J. S. Pollard.

Connecticut—George E. Corwin takes the place of Charles L. Colton as Deputy Commissioner on Domestic Animals, which is similar to the position of State Veterinarian in other States.

Dr. John F. DeVine, of Goshen, N. Y., stopped over in Washington, D. C., to renew friendships, while enroute to the meeting of veterinarians of adjacent States at Mountain Lake Park, Md., where he was one of the principal speakers.

The Farmer discusses State farms for tuberculous animals and contends that the establishment of such farms would save money for the Federal and State Governments as well as for livestock owners.

Dr. George W. Dunphy, formerly State Veterinarian of Michigan, is now associated with the Michigan State Board of Health.

COMMUNICATIONS

VIRGINIA ACCREDITED HERDS TURNED OVER TO APPROVED VETERINARIANS

There are 515 accredited herds in the State of Virginia, also 743 once tested free herds. Seventy-four accredited herds were turned over to the 40 private veterinarians since January 1, 1921.

There was considerable speculation as to the number of herd owners who would continue the accredited herd plan after free testing was discontinued, and they were required to pay the practitioners to apply the tuberculin test. Of the 74 herds, only 5 owners discontinued the cooperative agreement.

When it was first suggested that the practitioners would be asked to take an examination given by the State and Bureau, before accredited herds were turned over to them, I am quite frank to say that I was not in sympathy with the move. I felt that our veterinarians, after graduating from a recognized veterinary college, and passing the Virginia Veterinary Medical Examining Board, were then equipped to do first-class work, without further credentials from them. Nevertheless, after a second thought, I felt it was quite necessary to have some record of the standing of the men throughout the country, who were to take charge of the herds which the State and Bureau had tested, and retested until they were free from reactors, in order to know whether or not the veterinarians were sufficiently interested in the tuberculin test to give it their time and attenion. Therefore I wrote all the practitioners in Virginia, suggesting that they take the accredited herd examination, provided by the U. S. Bureau of Animal Industry, if they cared to have this work turned over to them. As a result of this, I am happy to say that most of the veterinarians of the State have taken this examination and passed with distinction.

From the above it can be plainly seen that the tuberculin test work in Virginia is not only cooperative with the State and Bureau of Animal Industry, but the practitioner and the herd owner are equally interested in the cooperative work, and it is the result of this close cooperation that Virginia stands in the front ranks in this work today. I feel that I know whereof I speak, because on July 1 of this year I completed my nineteenth consecutive year as State Veterinarian of Virginia, and

there is hardly a veterinarian or a herd owner, and certainly no Bureau man, in this work with whom I am not personally, as well as officially acquainted. I believe it is a grand piece of work, and if we can include in the near future the "free area work," which has been mentioned so often by Dr. Kiernan, the result will be similar to that which we accomplished in tick eradication. We can look back and point behind us, first, to individual counties which have been pronounced "free from tuberculous cattle" (a free area), and later we may hope to have this free area territory include large portions of many States, with the final result that we hope not only to eradicate the disease from the individual States, but as time goes on, our hopes and belief are that bovine tuberculosis, which is now being controlled in the different States, will ultimately be eradicated, as I honestly believe determination and cooperation can achieve this end.

J. G. FERNEYHOUGH, *State Veterinarian.*

Richmond, Va.

TO THE EDITOR:

In preparing my mailing list, as Resident-Secretary for New York, it was necessary to go over the list of "registered veterinarians," as published by the University of the State of New York. In doing this work I was very much surprised to find how rapidly the non-graduates were falling by the wayside, as you will see by the enclosed marked copy, which is self-explanatory.

WM. HENRY KELLY,
Resident Secretary.

MISCELLANEOUS

THE CAUSE AND PREVENTION OF LAMZIEKTE OR LOIN DISEASE

IN MARCH, 1919, announcement was made by Sir Arnold Theiler, K. C. M. G., Director of Lamziekte Research, and his coworkers that the cause of the fatal paralytic disease of cattle of the South African "veld" known as lamziekte or gallamziekte is a toxin derived from animal debris scattered over the veld, such material as rotten bones and decayed flesh of other animals or even of small wild animals or birds. Such material chewed or ingested by the grazing cattle with depraved appetites engenders the disease. A mass of experimental work since that time has furnished abundant confirmation of the stand taken.

In view of the fact that we have in this country, especially in southeastern Texas, a malady known as loin disease, down-in-the-back, lumbar paralysis, muscular weakness, or stiff disease, which it is quite evident is the same as lamziekte of South Africa, the essential features of Theiler's article will be presented at length. Furthermore, it is quite possible that the so-called salt sickness of Florida will be found to have a similar explanation, while some of the reported cases of botulinus poisoning of cattle must in the future be differentiated from lamziekte or loin disease.

The previously held views as to the etiological factors of lamziekte have now been grouped by Theiler into a coordinated chain, each link of which plays an important part in the theory of causation.

These are enumerated as follows:

1. The toxin which poisons the animal.
2. The germs that elaborate the toxin.
3. The carcass material out of which the toxin is manufactured.
4. The pica or depraved appetite of the animal that impels it to eat decomposing bones and flesh which it would otherwise spurn.
5. The vegetation which produces the pica, the soil characteristics upon which the vegetation grows, and the climate of the district.
6. The susceptibility of the animal concerned towards pica and towards the toxin.

Cattle are almost exclusively affected because these animals are almost exclusively afflicted with pica (depraved appetite), but the disease can be produced experimentally in horses, sheep, goats, rabbits, guinea pigs, ostriches and ducks. Cattle contract the habit of chewing bones, and it is this bone craving, which the authors designate as "osteophagia," that causes these animals to be most prone to contract the disease, and it is the absence of pica in the other animals that saves them from lamziekte.

Any one effective break in the etiological chain of circumstances is said to be sufficient to prevent the disease; hence, the most practical eradicative measure is based on the breaking of the chain at its weakest link.

It may happen that only on account of the absence of link 2 the disease is not prevalent in areas known not to be lamziekte areas, yet the introduction of a lamziekte animal into a clean area might be a source of future cases of the disease.

THE TOXIN

Any sort of carrion may serve as origin of the toxin—not bones alone.

When pica is very bad cattle blindly attempt to satiate their appetites by eating hide, dried flesh fragments and other filth, yet rotten bones represent the usual source of the trouble, but rotten flesh may contain much more of the toxic substance.

The most toxic material of all has been prepared in the laboratory where so small an amount as one-ten-thousandth of a gram per kilo of body weight killed cattle by subcutaneous injection, i. e., less than half a grain can produce the disease in a 600-pound beast. When given by the mouth a much larger amount is necessary, but then less than a gram (15 grains) may prove fatal. So far it has required an ounce to four ounces of the veld material to kill an animal by feeding (drenching) test.

Old bleached bones seldom retain much of the toxic substance, but this resides in the bones that have been least weathered. Perhaps in certain cases the toxin is present as much as six months or longer, this depending on the time of year and other circumstances.

Depending on the amount of toxic material fed (rotten flesh or bones) the disease can be produced at will in from 17 hours to 10 days.

The toxin is easily destroyed by 130° Centigrade of heat, and as the treatment for pica symptoms is the feeding of sterile bones

or bone meal, the infectious bones may actually after sterilization be used to cure pica. The closest analogy for the lamziekte toxin is the toxin of *Bacillus botulinus*, but the identity with this toxin is excluded by its physiological behavior toward different animals. The symptoms of experimental botulism in cattle are distinctly different from lamziekte.

TOXIGENIC SAPROPHYTIC BACTERIA

The toxigenic bacteria grow upon dead organic matter rather than in the living animal, as it has been definitely proved that the disease is infectious, not contagious. The amount of the toxic material eaten by the animal has a direct bearing on the early or later onset of the disease, and the disease occurs only when the bacteria grow saprophytically upon dead organic matter. The organisms are spore-bearing anaerobes and thus maintain their existence by resistant resting spores. They grow in mixed culture with other aerobic putrefactive organisms that use up the present oxygen or in association with oxidizing enzymes. Impure toxic cultures are easily obtained in which three different sporulating organisms are constantly present. The predominant one is *B. putrificus*, a common soil anaerobe. The second dominant one is a "racquet form," and the third is a "drumstick" form. The latter is the one to which suspicion attaches. The two latter germs have not as yet been identified.

Animals dying in a noninfected section of the country do not appear to harbor the necessary anaerobic organisms in their cadavers which will transmit the typical lamziekte disease, but animals drenched with toxic material from a lamziekte area die and then their putrid carcass material will convey the disease to other animals feeding upon it. However, it is believed that climate, soil, putrefactive flora, etc., have an influence on the disease being more prevalent or favorable in one area than in another. For instance, pica may be common in an area where the disease does not occur, which fact would tend to show that aside from the bone eating, the proper bacterial flora that produces the toxin must also be present.

The manner of spread of the disease is by blow flies, dust, birds, and by moving animals, for longer distances. The blow fly larvæ feeding on such animals are toxic, and the pupæ from such larvæ are toxic. A carcass putrefying in the winter is less dangerous than in the summer, and this is without doubt due to the

absence of the blow fly which intensifies the amount of infection in summer. Heavy and continuous rains help to dissipate the toxin on the veld. An animal from the lamziekte area may harbor the anaerobes in its intestines for quite a while if it does not die, and may cause new centers of the disease should it die in a free area where pica is prevalent. Inasmuch as each animal from or in a lamziekte area is an incubator for the germs of the disease at its death, the veld or pasture may become so heavily infected that the cattlemen may have to abandon their business. To control lamziekte it is hopeless to attempt to eliminate the organisms by any other means than by destroying its food supply, i. e., *by cleaning the farm of all carcass materials.*

THE MATERIAL OUT OF WHICH TOXIN IS MADE

Definite attention is called to the fact that any dead animal matter is a good substrate for the bacterial growth that causes the production of toxin, i. e., any animal carcass or any substance rich in protein or nitrogenous matter. It is also likely that protein-rich vegetable matter might also act as a good substrate or any dead vegetable matter at all could serve for toxin production provided the proper degree of anaerobiosis would obtain. It is even suggested that a silo might at times have the proper conditions for growth of the organisms. The point of importance, though, so far as as lamziekte is concerned, is dead animal matter, even carrion of any kind as dead birds, rabbits, lizards, frogs, etc. But by far the greatest source of danger is dead cattle, calves, sheep, poultry, etc. Naturally enough, when the larger dead animals are carefully disposed of the greatest danger will be removed, yet so long as the smallest beast of the field is there, so long can a small loss be expected, especially in summer.

PICA

Conditions on the South African veld are apparently very conducive to depraved appetite on the part of the animals and in the lamziekte areas is probably due to one cause (shortage of phosphorus). Its distinction from other forms of pica must therefore be kept in mind, as under the circumstances the animals naturally have intense craving for bones and it was noted that when the craving was worst lamziekte was not far off. Indeed, years ago the supplying of bone meal to the animals in a lamziekte area prevented the disease by dispelling an appetite for bones on the veld.

It was found that the craving for bones (which, in other words, is a craving for phosphorus) at different seasons of the year *had a direct bearing on the phosphorus contents* of the grasses of the veld at the corresponding periods, yet certain discrepancies not yet explained continued to occur. Phosphorus reduces craving quickly, though much depends on the components of the ration. A ration of wheat bran containing 2 per cent phosphoric oxide reduces craving in grazing animals in a few weeks when fed at the rate of 2 pounds a day.

Bone meal, the obvious preventive for bone craving, generally reduces pica to zero in a month, when fed at the rate of four ounces per head per day to average animals. A very heavy ration of bone meal, one-half to one pound daily, sometimes reduces craving in one or two weeks, and it is strongly recommended if lamziekte is bad, or until osteophagia (bone craving) subsides. Precipitated calcium phosphate, sodium phosphate or pure phosphoric acid may be substituted for bone meal provided 16 to 26 gm. of phosphoric oxide per head, as would be contained in an effective bran ration, were given. A system of test feeding of cattle in enclosures will readily detect the bone cravers, and these are the only animals that it is really essential to feed the bone meal or supply phosphorus by other means.

The toxicity of the carcass material is at its worst during the periods of droughts, i. e., in South Africa in the spring and early summer.

CLASS OF ANIMALS AND SUSCEPTIBILITY TO THE DISEASE

For practical purposes cattle almost exclusively come up for consideration. The etiological chain referred to previously may be broken by immunizing the cattle, but natural immunity is so fleeting that this is scarcely to be considered. The attempt to build up a more lasting immunity is now being worked out, although greater reliance is being placed on breaking the etiological chain at link 3, i. e., *removing material out of which the toxin is formed.*

CONCLUSIONS

1. Clean the farm of all bones and carrion and keep it clean.

2. Test bone craving by turning animals into a corral where a feed trough contains sweet bones and putrid bones. The putrid bone eaters are to be marked and vigorously treated while the other bone eaters may be treated with smaller quantities of bone meal.

3. The collected bones if properly boiled for three successive days or sterilized by steam under pressure at a temperature of 130° Centigrade may be made available for feeding the animals to prevent craving.

4. Only the cravers need be fed and sweet bone meal may be most easily and most quickly supplied by feeding one-half to one pound to each bone eater per day. When the craving subsides three to four ounces of bone meal per day will suffice.

5. Repeated tests may be necessary to detect others that have acquired the disease.

6. Bone meal is best fed by using a large number of small troughs. It is advisable to mix a little bran with the bone meal.

7. It would be too expensive to feed bone meal all the year round. Therefore, it should be supplied when the craving is at its worst, which is during the dry season, in the spring and early summer, before the heavy rains set in. If a farm could be kept perfectly free from *all carcass* material, bone meal would not have to be fed at all.

8. a. Feed bone meal only to bone eaters and not to entire herd.
   b. Reduce rations when craving stops.
   c. Feed only during certain seasons of year.

9. Last injunction—*Clean the farm of all carcasses and keep it clean.*

CANADIAN CATTLE IMPORTATIONS

Sir Stewart Stockman, director of veterinary research at the Board of Agriculture, London, was a witness before the Royal Commission on the importation of Canadian cattle yesterday. Foot-and-mouth disease was conveyed to his country, he said, in spite of the fact that animals were excluded. At considerable expense and inconvenience they were able to deal with those outbreaks, which were confined almost entirely to certain parts of the country, but if foot-and-mouth disease was introduced by livestock and distributed over wide areas it was practically certain they would have to face a general outbreak. He referred to the extensive nature of animal diseases prevailing in Continental countries, and remarked that that would be the sort of thing to which they would lay themselves open if they admitted overseas cattle. It was a very risky business, although, of course, the risk could be slightly diminished by a process of differentiation and quarantine.

Asked by the chairman, Viscount Finlay, what he had to say about the admission of Canadian cattle, witness said he had examined the records, and considered that the department in charge of contagious disease in Canada was good and had done everything possible to eradicate disease. "I have the greatest admiration for their record, and Canada as a country is in a general way as free from disease as ourselves," witness added, "but I cannot say there is no risk in importing cattle from Canada without quarantine or differentiation. I would not say Canada is any cleaner than this country, and quite rightly to my mind Canada imposes a quarantine on animals from this country." If Canadian cattle were admitted he was of opinion that there should be a month's quarantine at the ports in this country. In reply to Mr. Aspinall, witness said the longest period of quarantine would be three months for pleuro-pneumonia. Foot-and-mouth disease could be spread by animals eight months after they had recovered. Further, witness dealt with the prevention of the spread of foot-and-mouth disease, and stated that it would be even more expensive to stamp out other diseases; and under further cross-examination he said it was a fact that there was no quarantine for hay and fodder coming from Canada.—*From Daily Telegraph, London.*

The following story comes from North Carolina by way of the Memphis *Commercial-Appeal* and the *Journal of the American Medical Association*:

"A thief has been sneaking into the barn at night and milking a cow owned by a Johnson County farmer. The planter determined to put an end to the culprit's depredations. A few days ago the cow was transferred from her regular stall and a young mule was substituted. Several nights ago the farmer was aroused by a terrific racket in the vicinity of the stable. The planter grabbed his shotgun and ran to the barn, but the thief had escaped, leaving a battered milk pail, a small stool and a hat in the mule's stall."

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